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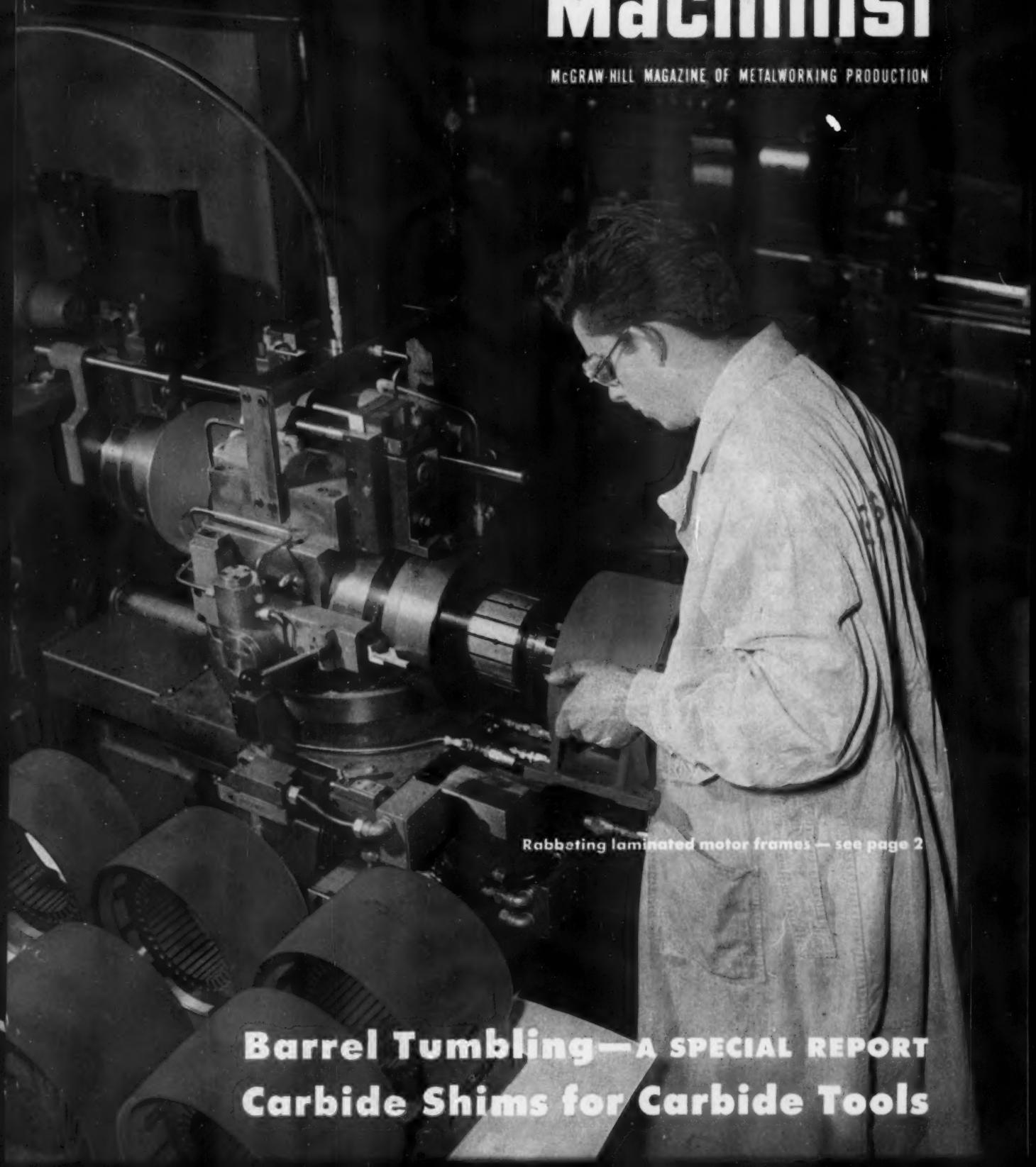
American Machinist

JANUARY 17, 1955

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



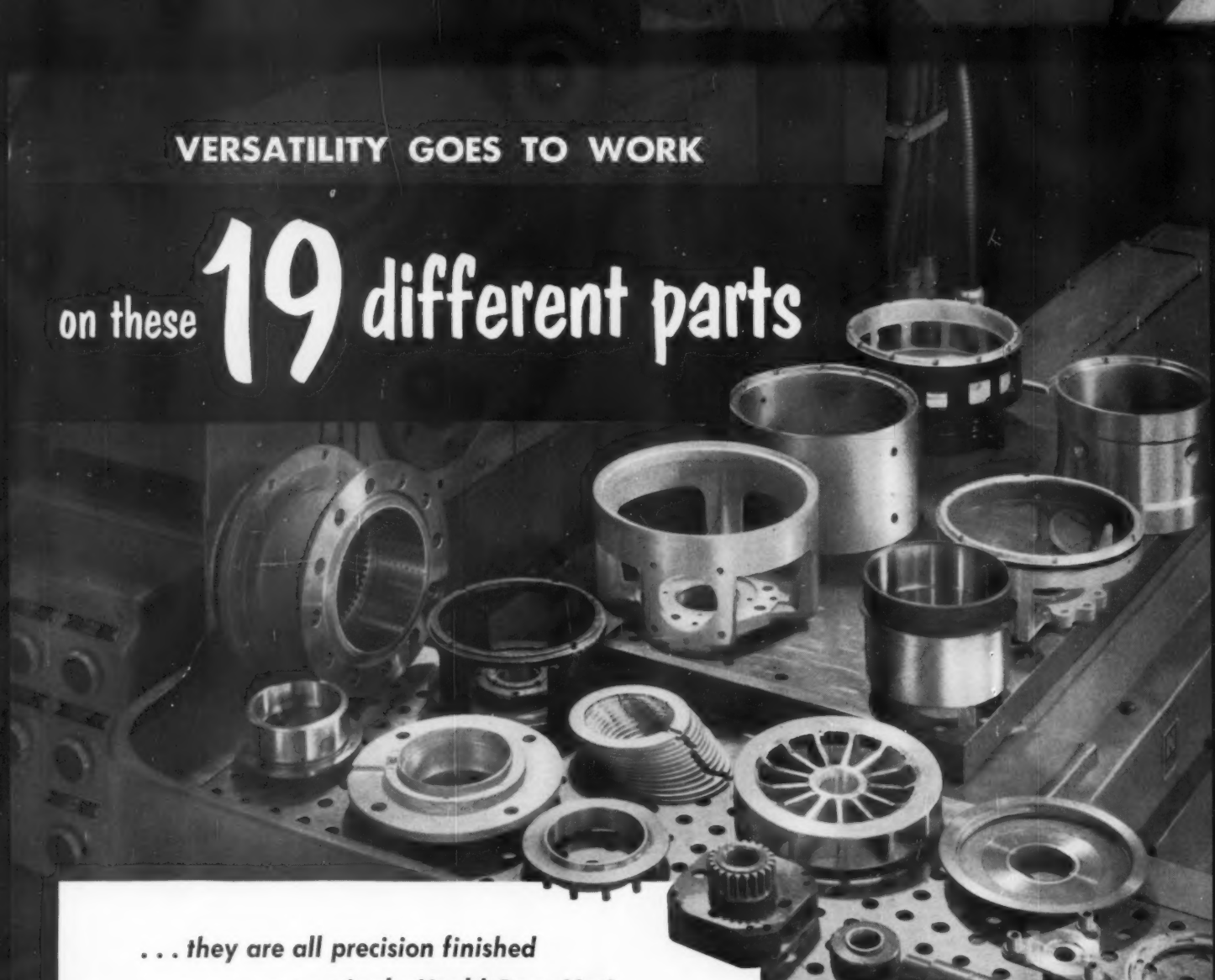
Rabbeting laminated motor frames — see page 2

Barrel Tumbling—A SPECIAL REPORT

Carbide Shims for Carbide Tools

VERSATILITY GOES TO WORK

on these 19 different parts



. . . they are all precision finished on a single Heald Bore-Matic

YOU'VE HEARD a lot about Heald versatility. In the photograph above, you can *see* it. For these 19 different aircraft parts are interchangeably accommodated by any one of six standard Model 221 Bore-Matics.

Purchased as "bare" machines, they were equipped by the customer with interchangeable tooling and fixtures to cover the wide range of operations required and take full advantage of the versatility that's built into every Heald Bore-Matic. Either the work or the tooling can be rotated and several different surfaces can be borized simultaneously or in sequence at a single loading.

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NUMBER OF COPIES PRINTED THIS ISSUE 38,009

chips

AUTOMATIC RABBET . . . Our front cover shows a special adaptation of a No 12 Gisholt hydraulic automatic lathe which machines the rabbet fit on GE motor frames. Unusual about the job are fact that laminations are already installed (windings go in next), and that the twin-arbor setup can operate either with continuuous automatic cycle or single-piece automatic cycle. While one arbor holds the piece for machining, the other is reloaded. When machining is completed, the table moves out, indexes 180°, and moves in to position with the next piece.

CARBIDE SHIM . . . One day last Spring, our executive editor spoke to the ASTE chapter in Hartford. Some time later that night (he refuses to say when), two foremen and a carbide-toolman got around to showing him some trick tools from an auto trunk. The resulting story, at long last cleared for publication, heads this issue. Roland Hudaverdi describes two types of lathe tools in which one carbide, because of its stiffness, becomes the shim for a harder (and of course more brittle) tool bit. If you run automatics, you'll want to try these two.

FINISH PLANING . . . You'll recall that not-yet-ended argument about the relative virtues of grinding and hand scraping of bearing surfaces. Well, the Russians, true to custom, now confuse the whole argument by suggesting planing instead of either. Here's the latest in a series of translations from the Russian, with sketches of tools and setups. We hold no brief for the process, merely report it after deleting the praises for Soviet ingenuity and ideology.

CHIP CONTROL . . . J F Jones, factory engineer for Fellows Gear Shaper, presented a very thoroughgoing paper at the recent meeting of the American Gear Mfrs Assn. From it, we have selected a meaty 6-page article, explaining how a slight change in rake angle can increase tool life up to 400%, output 100%.

FROZEN MERCURY . . . To keep you up to date on investment casting, Irvin Kramer, veep of Mercast Corp, gives you a simple description of frozen-mercury molds, how they're made and where they're used.

TUMBLING . . . Periodically, just to keep abreast of a fascinating branch of Metalworking (and, let's confess—to enjoy some Penna Dutch cooking), one of our editors drops in at Hamilton Watch Co. This time we come up with a very thorough dissertation on how to finish tiny parts, without damage, by tumbling. It takes off burrs, removes scratches, and so on. The details are in our current Special Report (see biog).

COMING . . . *AM* for Jan 31 is a very special one—the 1955 Production Preview. It will contain something like 176 pages of descriptions of new shop equipment, materials and parts, a classified catalog of the more than 2400 items we published during 1954. Watch for your copy of this handbook of the latest in tools.

Tumbler . . . H L Hovis received his BS from Lebanon Valley College in 1929, has been with Hamilton Watch Company ever since. He developed analytical procedures and applied chemistry to the watch industry for 10 years, then became works chemist in the new Control Lab, responsible for control of chemical and metallurgical processes. In 1949, he became supervisor of chemical research; in 1951, chief chemist. During this time, he directed work on tumbling (see Special Report). In March, '54, he became supt of Metals Processing Sections, handling the Controls Lab, Heat Treat, Physical Measurements Lab, and Metals Processing Section, all in the Production Engrg Group.

Now you can grind straight bevel Coniflex® gears

You can *now* use hardened and ground straight bevel gears for many angular drives requiring extreme precision and load carrying capacity.

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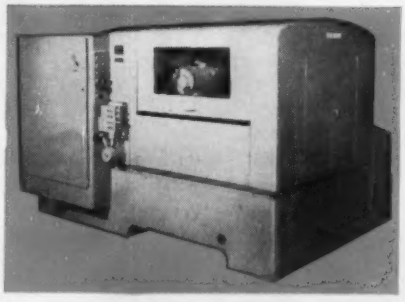
Wet-type grinding on this machine provides fast cycles and excellent finish. Set-up calculations are simple. The completely automatic cycle of the No. 105 Grinder not only assures uniformity of production but also provides great savings in time and production costs.

We will gladly send you more information about the No. 105 Straight Bevel Coniflex Grinder upon request.



The No. 105 Grinder accommodates straight bevel Coniflex gears up to 8½" pitch diameter, 3DP with ratios up to 6:1, cone distances up to 4¼". Gears 20DP and finer may be ground directly from the solid; coarser pitches are ground after semi-finish cutting and hardening.

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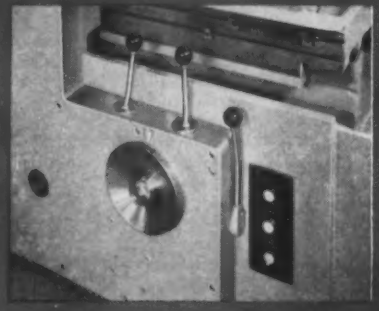


Convenient, compact grouping of operating controls reduces fatigue. HyPowermatic design will make a big hit with your op-

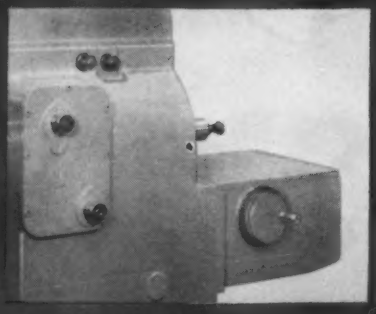
Hardened and ground table ways and square gib construction add their share to HyPowermatic's high cutting capacity.

Chip catcher bed design keeps the floor clean. Chips and cutting fluid stay where they belong,

HyPowermatics

duty milling operations

CINCINNATI No. 420-184 HyPowermatic Milling Machine with Automatic Quill Retraction.



Changing spindle speeds quickly is no problem for low production setups. Quick change spindle carriers are available at extra cost.

Save the smooth surface made by face milling cutters, with Automatic Quill Retraction (optional equipment at extra cost).

So Fast you may wish

Shown above is the No. 4 GS Gear Shaper equipped for fully automatic loading, cutting and unloading.

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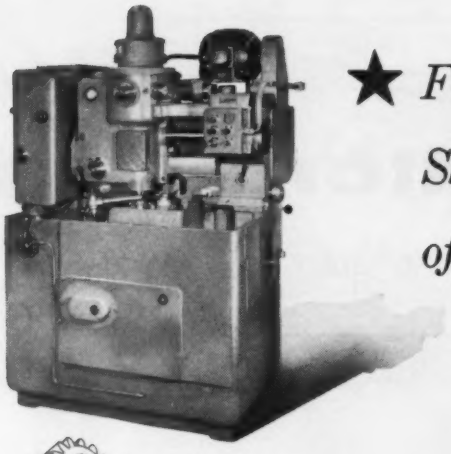
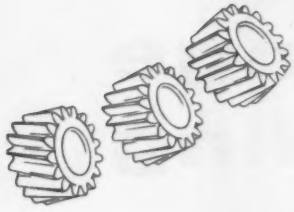
to use MAGAZINE FEED!



★ *Fellows New No. 4 GS Gear Shaper ideal for mass output of automotive pinions.*



Rotary feeds of .008" to .024" per stroke of a 4 inch cutter with a husky drive mechanism operating a 3⅜" diameter cutter spindle at speeds ranging from 98 to 635 strokes per minute make the No. 4 GS Gear Shaper a high production machine for gears up to 6" pitch diameter and 2" face width.

To utilize its production speed to the greatest advantage in the smaller size range, the No. 4 GS is designed to facilitate the addition of work magazines or other work loading and unloading devices. Automatic feed production rate for 1-1/16" diameter x ⅝" face width automotive pinions is 1 per minute. Blanks are (1) fed from a feeding device down a chute to the magazine slide, (2) automatically located and clamped on an expanding arbor, (3) cut, (4) automatically lifted off the arbor and (5) ejected into the unloading chute.

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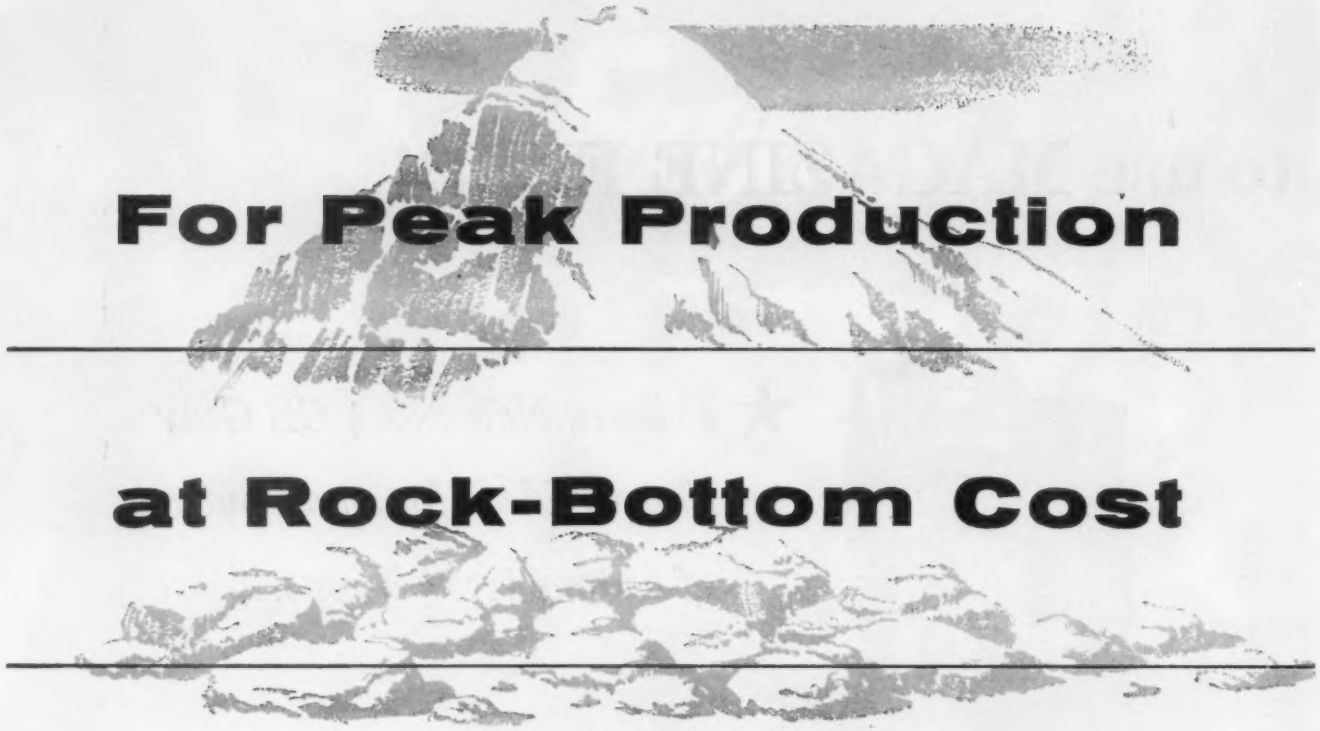

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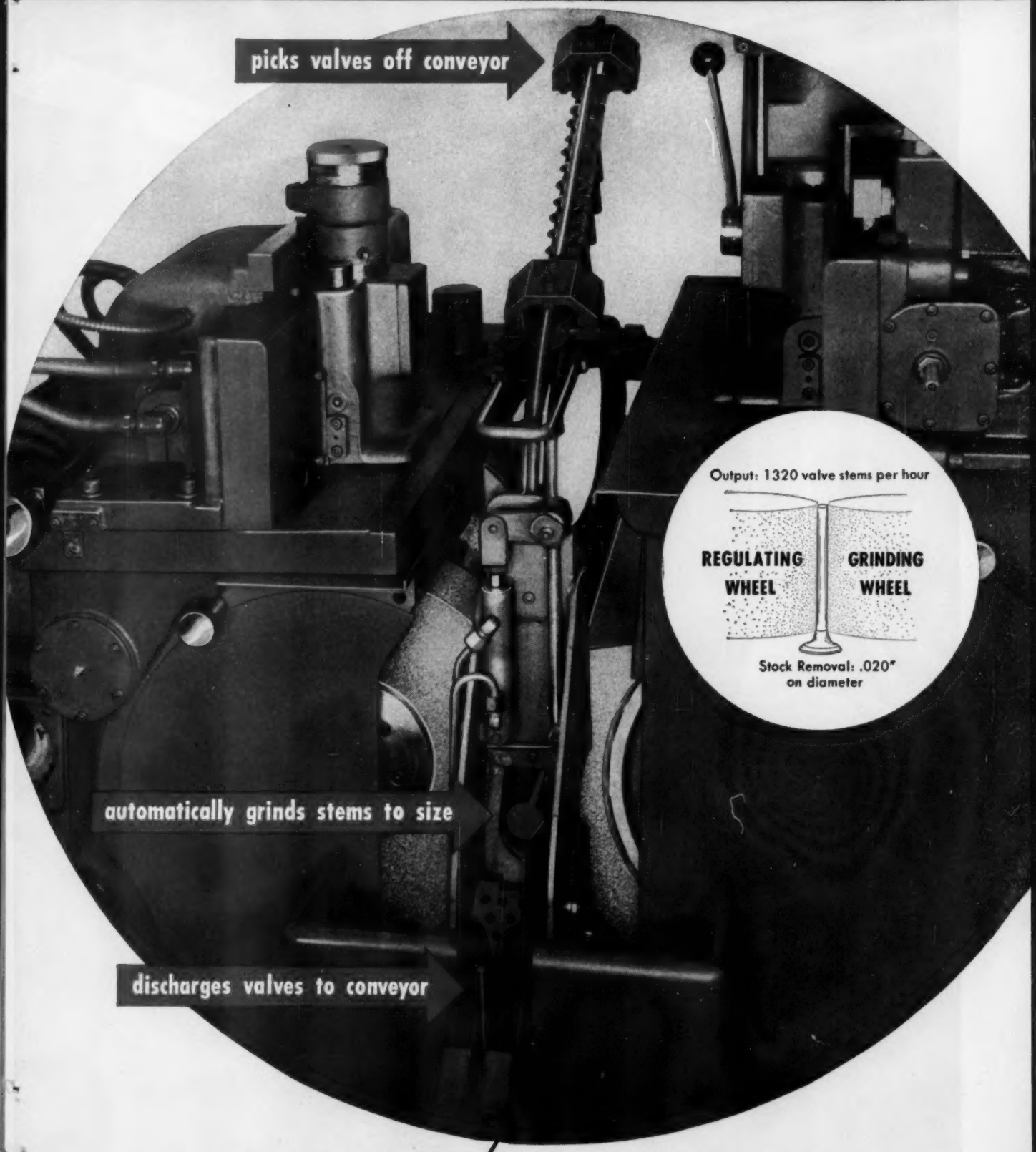
cuts centerless grinding costs


picks valves off conveyor
Output: 1320 valve stems per hour
REGULATING WHEEL
GRINDING WHEEL
Stock Removal: .020" on diameter
automatically grinds stems to size
discharges valves to conveyor

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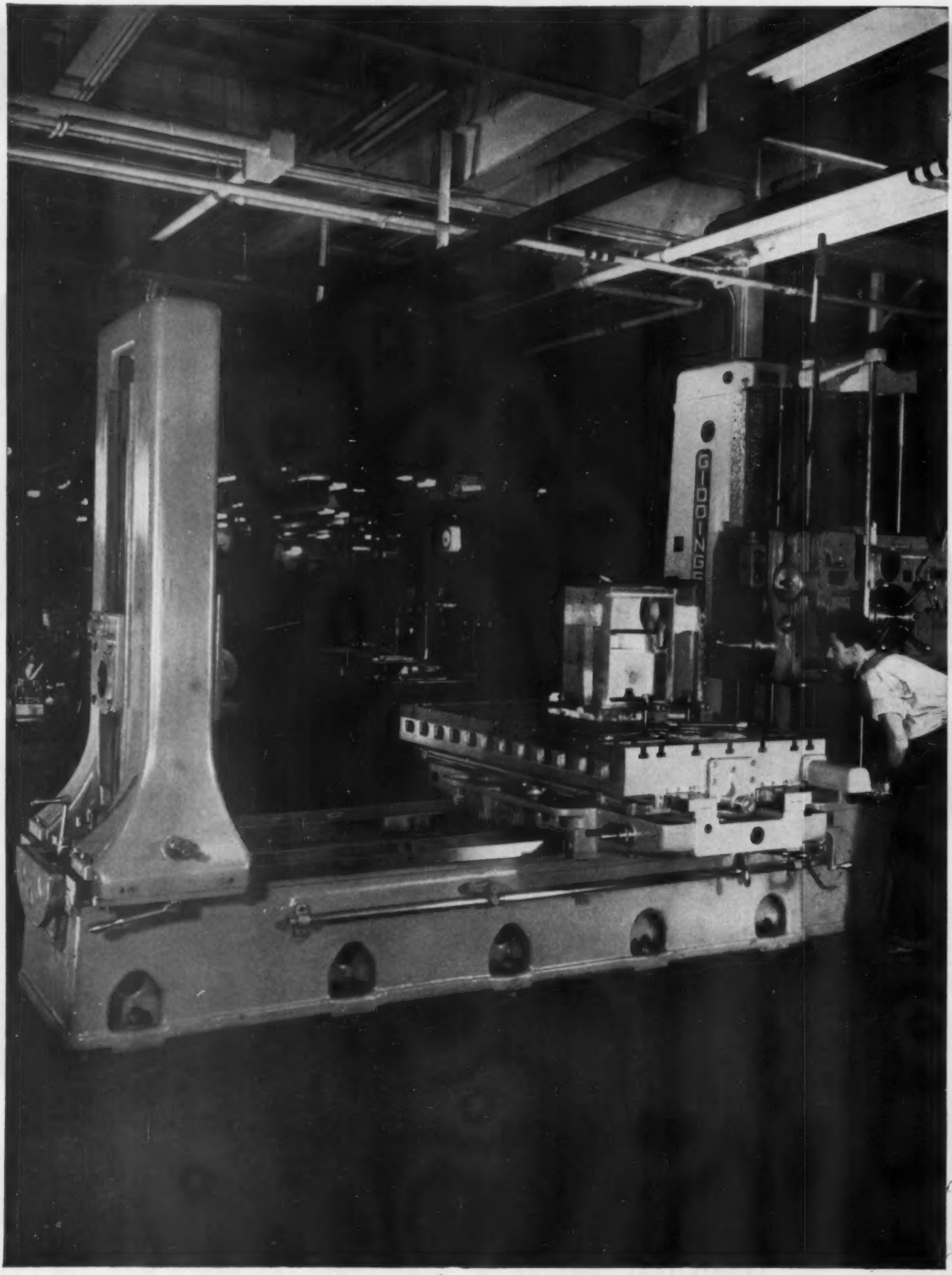
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This G&L 340-T Horizontal Boring, Drilling and Milling Machine . . . like all G&L tools . . . is highly versatile, superbly built. And it's years ahead of its time in design

Compare horizontal boring machines feature by feature, advantage by advantage. Study the quality of their construction, the basic components and accessories or attachments available. You'll soon discover why the table type G&L 340-T is unmatched in its class for capacity, versatility and long-lived precision.

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The three-wire method is probably the best known and most widely accepted system of measuring pitch diameter of screw threads. Equipment required includes only a set of VK Thread Measuring Wires of proper diameter and an accurate measuring instrument.

Van Keuren Thread Measuring Wires have been developed over a period of many years of pioneering in the precise measurement field. They are made to National Bureau of Standards specifications, are held within .00002" for roundness, straightness and identity and to within .000025" of exact size.

VK Thread Measuring Wires are made of long-wearing, tough and beautifully finished high speed steel and are either 1⅞" or 2" in length. Every wire is subjected to the closest criteria in today's standards of accuracy.

In addition to set No. 20, shown here, VK furnishes many other standard sets as well as special wires in diameters from .001" to 1.500."

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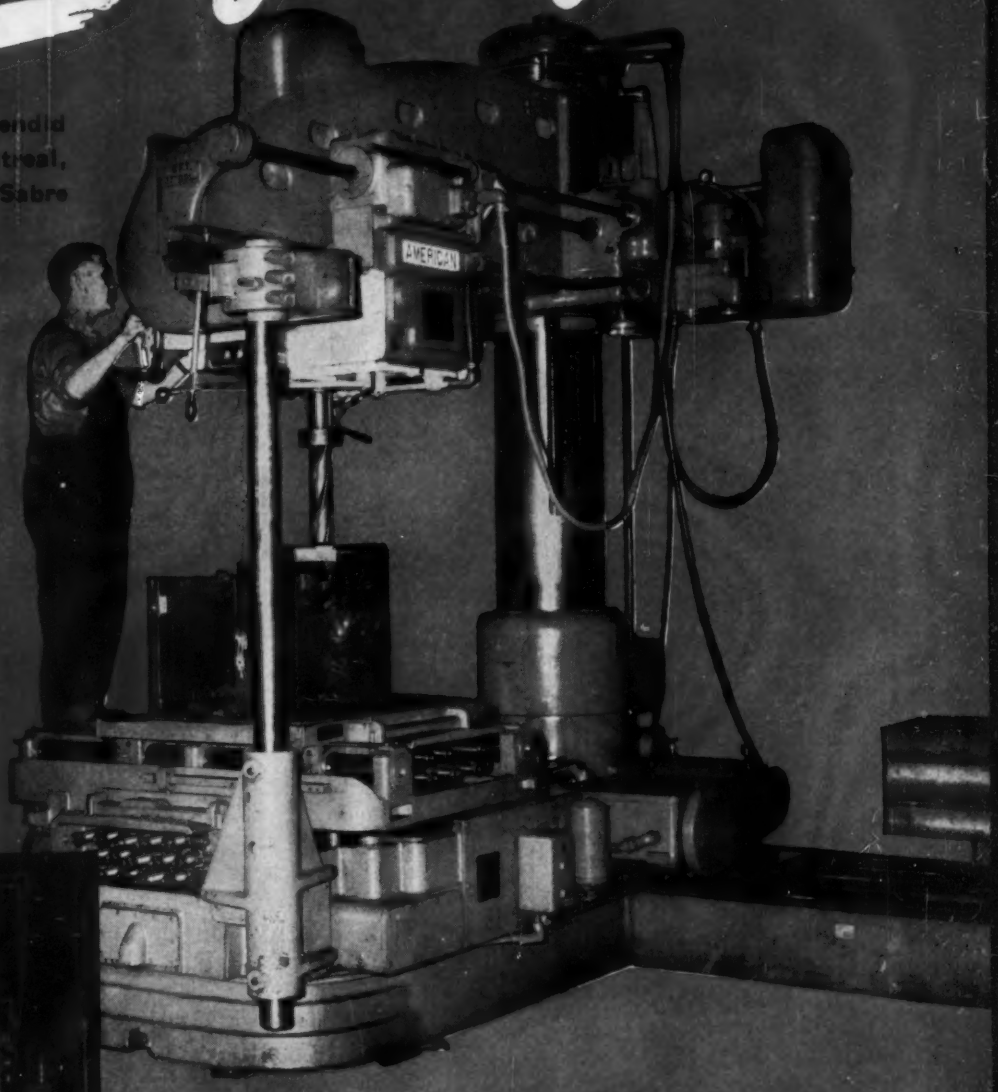
On TOP of his job!

This operator is doing a splendid job at Canadair Limited, Montreal, on the production of F-86E Sabre Jets for the RCAF and, as the illustration shows, he is right on top of his job, too.

He is proud of his fine new 6' 17" column "AMERICAN" Hole Wizard Radial. "It's powerful; it's sturdy; it's easy to operate, and I'm not worn out at the end of the day". What more could any operator ask? As a consequence he turns out a lot of fine work which makes his machine a paying investment for the company.



This *"American"* Hole Wizard Radial has a right angle base, on one wing of which is mounted a Bullard Man-Au-Trol Spacer—as shown by the illustration.

"AMERICAN" Hole Wizard Radials are playing a prominent part in the production of critical defense items for both the U. S. A. and Canada.

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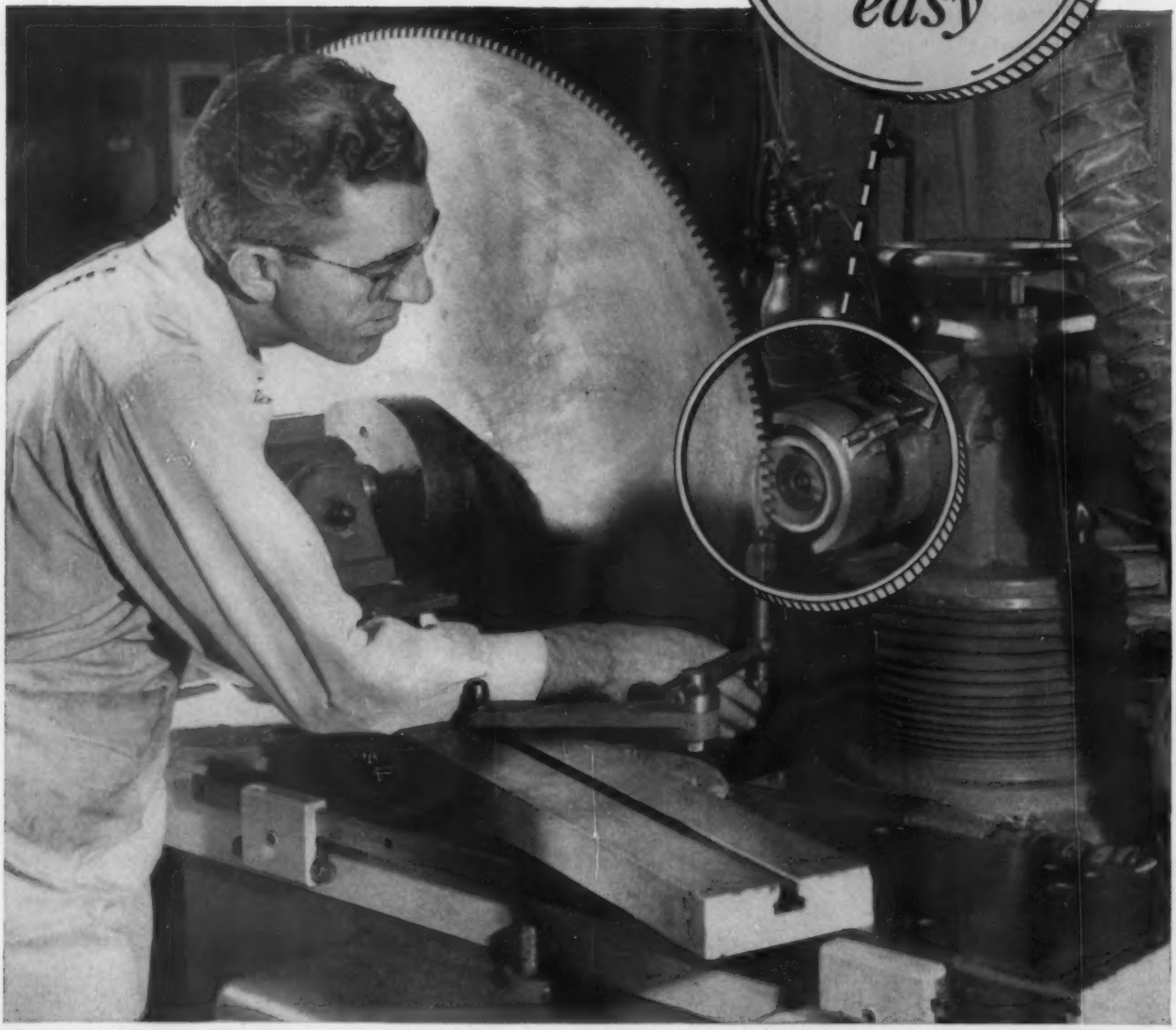
Fastest, most versatile cutter and tool grinder ever built . . .

The Norton No. 20 with the tilting wheel head...

makes hard jobs easy



Fast Set-Up For A Big Job. Ordinarily difficult to sharpen because of interference problems, this 39″ diameter special cutter is easily handled on a Norton No. 20 Cutter and Tool Grinder in the Carrier Corporation's Syracuse, N. Y., plant. The cutter is suspended vertically behind the table and base, while the No. 20's tilting wheel head is tilted down for backing off the cutter's 364 carbide teeth to the proper relief angle. Wheel guard is removed to show Norton cup diamond wheel.

If wrestling with tricky set-ups is slowing down your cutter and tool grinding operations, take a good look at the Norton No. 20 Cutter and Tool Grinder. It's especially designed for quick, easy set-ups of hard-to-handle workpieces.

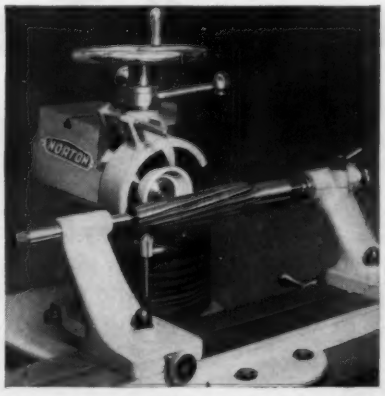
You can tilt the wheel head up to 15° above or below horizontal and swivel it a full 360°. This means no more time-wasting "trial and error" tactics — and new speed and economy when grinding taper reamers, step counterbores, form tools, milling cutters and other ordinarily troublesome jobs.

Other advanced features that add up to money-saving performance include: long table traverse and wheel slide travel . . . integral motor spindle . . . centrally located column elevating hand wheel . . . wheel slide graduated dials readable from any position and automatically lubricated table ways.

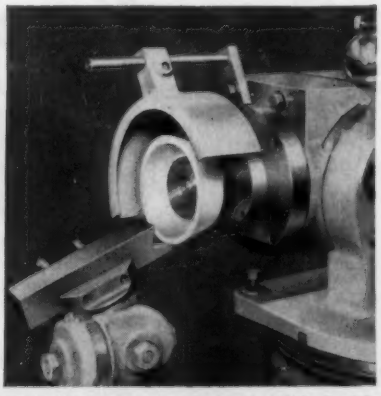
It will pay you

to get further facts on how the No. 20 can reduce your grinding time and costs. See your Norton Representative. Or write us direct for Catalog 189-4. And remember: only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

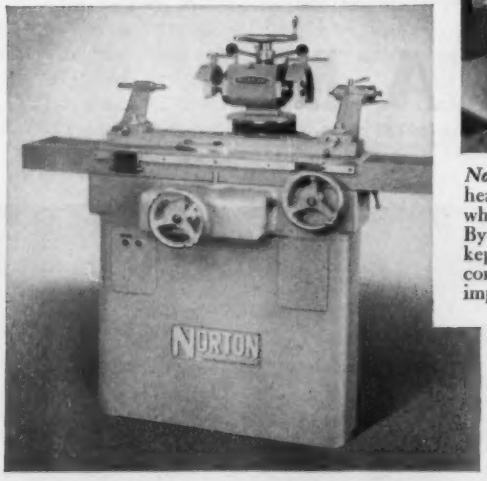
It Tilts! Chief source of the No. 20's remarkable versatility and speed is this wheel head that simplifies set-ups. It tilts up to 15° above or below horizontal and swivels through 360°. Accurate graduations provide for all adjustments and positive clamping devices assure stability during operation.



No Problem — Now. The tilting wheel head on the No. 20 is set at an 8° angle while grinding this spiral taper reamer. By this method, the clearance angle is kept constant for the full length. No more compromising or experimenting on this important job.



Grinding Form Tools Is Simplified with the No. 20's tilting wheel head. Here it is set at a 2° angle, while the tool is ground in a single set-up and wheel truing is minimized. Note the sharp corner which has been maintained on the tool.



Compact and Streamlined, the Norton No. 20 matches cost-cutting performance with space-saving design. Duplicate controls permit operation from front or either side.

To Economize, Modernize With NEW

NORTON

GRINDERS and LAPPERS

Making better products . . . to make other products better

District Sales Offices: Worcester • Hartford • New York • Cleveland • Chicago • Detroit

WOULD YOU SPEND

for all the production you can get from this new 10hp No. 2 Model CK universal milling machine? That's all it would cost you under...

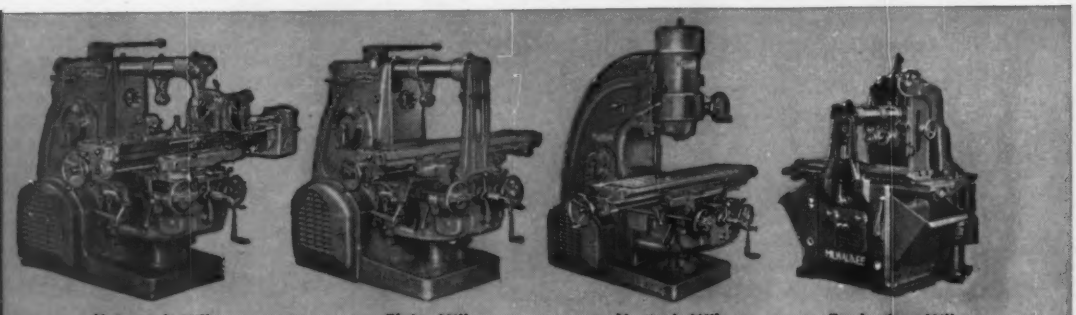
For additional data on this machine, see our catalog in Sweet's.

Kearney & Trecker's

TOOL-LEASE

PROGRAM

Kearney & Trecker manufactures a complete line of more than 250 standard knee and bed type milling machines and precision boring machines.

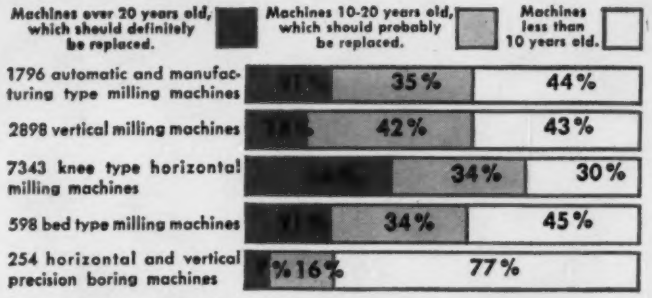


Universal Mills | Plain Mills | Vertical Mills | Production Mills

47½ CENTS PER HOUR

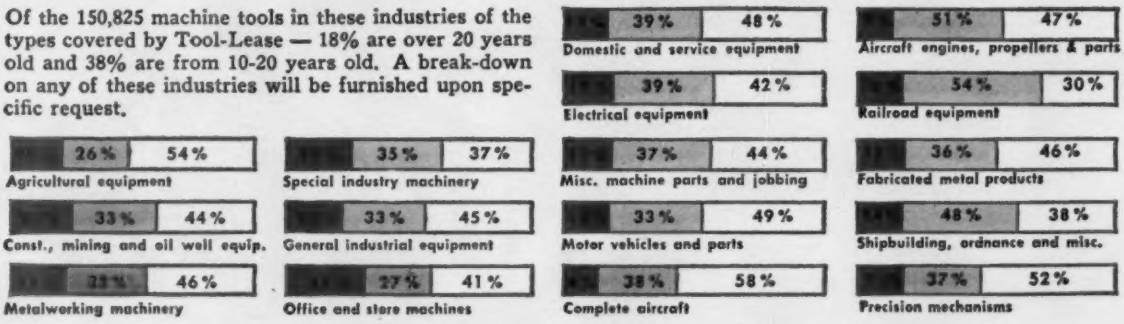
LET'S LOOK AT THE OBSOLESCENCE PICTURE IN THE SPECIAL INDUSTRY MACHINERY FIELD

Includes machines for food-products, textile, woodworking, paper industries, printing, glass-making, cement-making, incandescent lamp-making; paint-making, rubber-working, tobacco-products, shoe-making, and stone-working; smelting and refining equipment. Of the total 12,889 machines in use today which can be replaced by Tool-Lease equipment — 28% are over 20 years old, over 36% are 10 to 20 years old!



HERE'S THE OVERALL PICTURE IN THE ABOVE AND 15 OTHER BASIC INDUSTRIES

Of the 150,825 machine tools in these industries of the types covered by Tool-Lease — 18% are over 20 years old and 38% are from 10-20 years old. A break-down on any of these industries will be furnished upon specific request.



Figures adapted from 1953 American Machinist survey of metalworking industry

HERE'S another popular knee-type universal milling machine, packed with outstanding design and operating features. It's available for your immediate needs under Kearney & Trecker's Tool-Lease program.

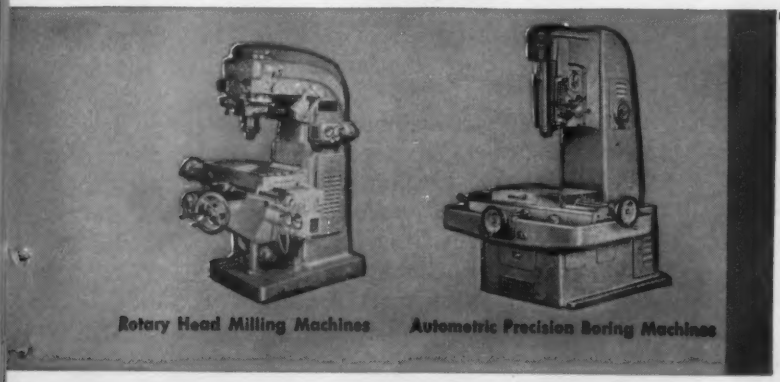
Under Tool-Lease Plan "A," one of three seven-year lease agreements offered by Kearney & Trecker, you make two semi-annual rental payments, totaling 25% of the machine's price during each of the first three years. Actually in dollars and cents, you pay 47½ cents per hour for this new 10 hp No. 2 Model CK universal milling machine. That means a machine installed in your plant and in operation — *literally for pennies an hour!*

What's more, under Tool-Lease, you can rent any of over 250 different types and sizes of standard milling machines or precision boring machines. All are available under three basic plans, with varying options to continue or terminate the lease, or to purchase the equipment. If you require special machinery or heavy-duty CSM bed types, special agreements will be considered.

For complete information on Tool-Lease, see your Kearney & Trecker representative or mail coupon to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

TOOL LEASE
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS
EQUIPMENT ®

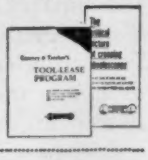
©1954



Rotary Head Milling Machines — Automatic Precision Boring Machines

KEARNEY & TRECKER CORP.
6784 W. National Ave., Milwaukee 14, Wis.

Please send me Bulletin TL-10A on Tool-Lease Program and booklet titled "Critical Picture of Creeping Obsolescence."



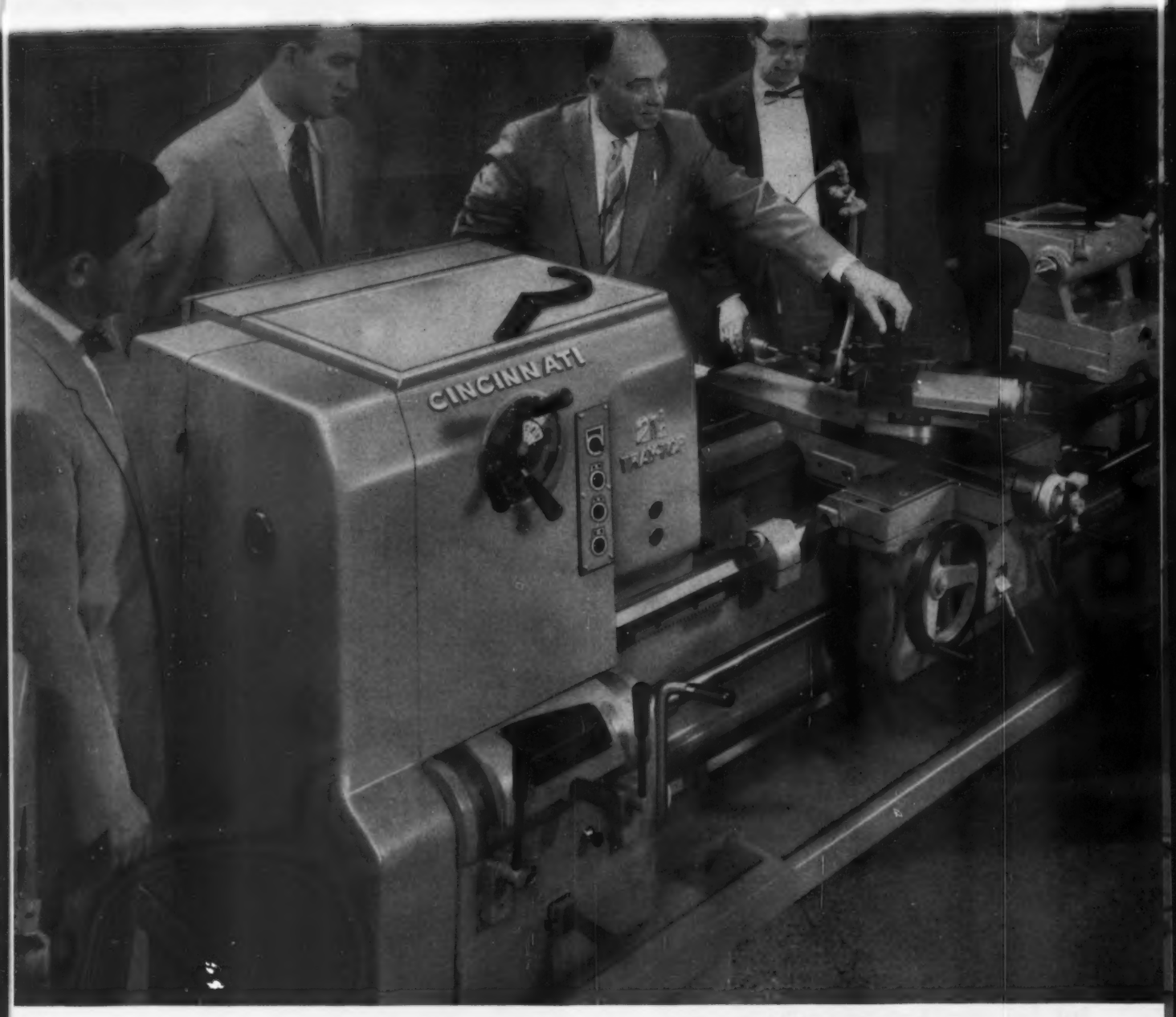
Name.....

Title.....

Company.....

Address.....

City.....Zone.....State.....



New Low-Cost Cincinnati Lathes Make Debut at Dealer Meeting

Cincinnati's latest lathes—the 21½" and 26" Tray-Tops—made their introductory bow October 18 before the expert eyes of 54 dealers. As a team of designers and engineers presented these brand-new babies, here's what these dealers saw and liked:

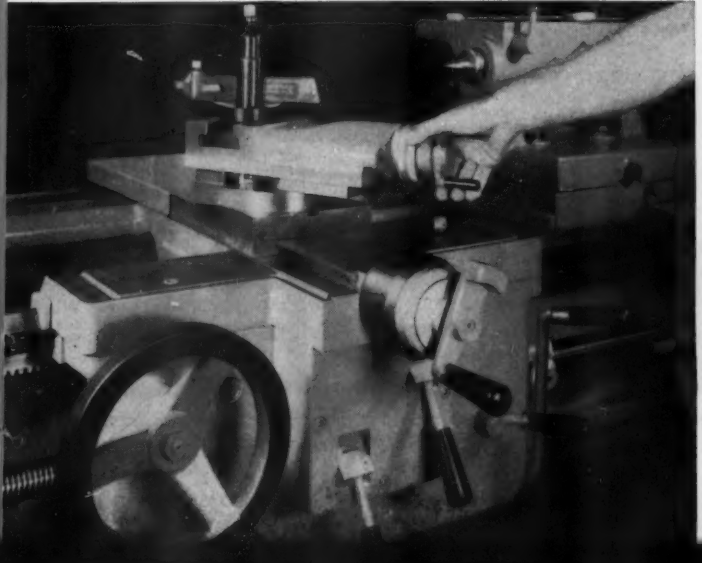
Lathes with 12 all-geared spindle speeds from 24 to 960 rpm in the high range—with 54 thread and feed changes—flame-hardened ways to retain built-in accuracies—Cincinnati's exclusive Color Match Speed Selector—a totally enclosed quick-change box and hardened gears in all three transmissions.

Best of all, they saw lathes priced well within the reach of every shop.

These low-cost Cincinnati Tray-Tops are so new that not all dealers have been supplied with display models. But that needn't keep you from getting the details now. Just write for Catalog T-117 and we'll rush complete descriptive literature. No obligation, of course. Cincinnati Lathe & Tool Co., 3241 Disney St., Cincinnati 9, Ohio, U. S. A.

TOTALLY ENCLOSED QUICK-CHANGE BOX guards gears against dirt, chips and foreign matter. It also provides a built-in oil reservoir for automatic lubrication. 54 thread and feed changes—range of 1½ to 92 threads per inch; range of feeds .0019 to .1215.

APRON is a one-piece, double-walled casting providing adequate support for all shafts. It incorporates a built-in safety clutch, oil shot pump lubrication and positive jaw feed clutches.



COLOR MATCH SPEED SELECTOR is simplicity, itself. No more reference to index plates and lever positions; just match up the color lines. Spindle speeds range from 16 to 640 rpm (standard) or 24 to 960 rpm (high). Pressurized lubrication to bearings and gears. Three-bearing spindle. 2 3/16" diameter spindle hole available.

Yes, from the Brooklyn Bridge to the Golden Gate, your only source for time-saving, money-saving Morse *Electrolized* Drills, Taps, Reamers, Cutters and End Mills is your nearest Morse-Franchised Distributor.

Certified test-reports prove that . . . on jobs where there's excessive wear and abrasion . . . *Morse Electrolized Tools last 2 to 10 times longer than untreated tools.*

And that's why, on any tough job you have now . . . or on *any* job, tough or not, where you can profit by this extra tool life and performance . . . it pays to consult your Morse-Franchised Distributor on the application of Morse *Electrolized* Tools to your own particular needs. He has the practical knowledge . . . and he's backed by the top line and the top engineering service of the cutting tool industry.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

MORSE

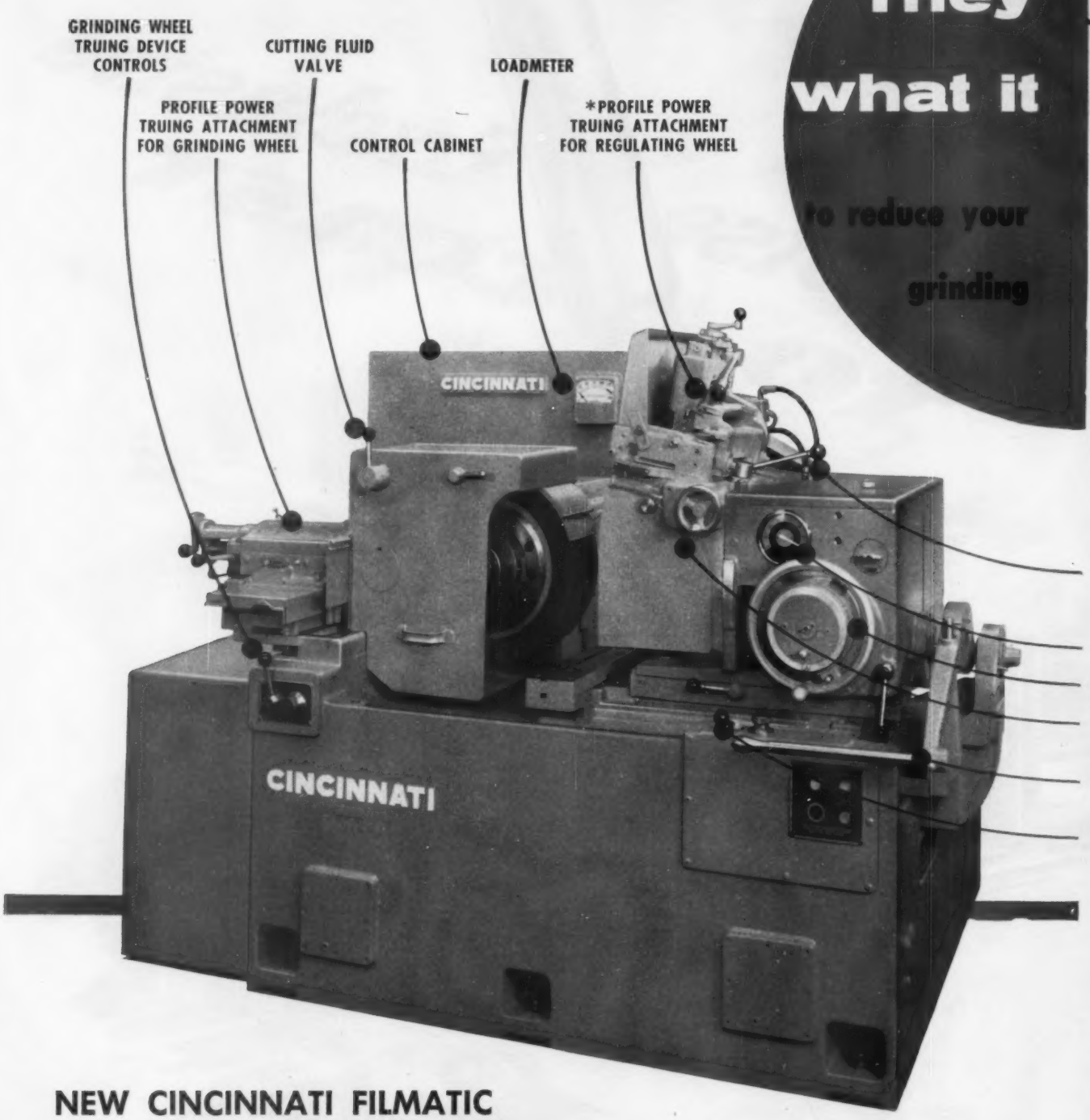
Morse Exclusive TO COAST

Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

They what it

to reduce your grinding



NEW CINCINNATI FILMATIC
No. 2 CENTERLESS GRINDER

Write for complete details. Catalog No. G-644.

have takes centerless costs

Thirty-three years of experience in centerless design and application has gone into the new CINCINNATI FILMATIC No. 2. You will find it more accurate, more versatile than ever before. Time-proved Cincinnati advantages have been retained . . . bed-rock grinding wheel spindle mounting; FILMATIC grinding wheel spindle bearings; double slide construction between bed and regulating wheel housing; simplified method of truing regulating wheel. And now these additional advantages are included . . . infinitely variable regulating wheel speeds; pre-loaded, precision ball bearing lower slide; pressure lubrication of regulating wheel spindle bearings; stabilized infeed screw. ¶ Of course, many more features desired by centerless grinder users are incorporated in the new CINCINNATI FILMATIC No. 2 Centerless Grinder. Would you like to know more about them? Write for new catalog No. G-644.

CINCINNATI GRINDERS INCORPORATED **CINCINNATI 9, OHIO**

FILMATIC

REGULATING WHEEL SPEED RANGE LEVER

TACHOMETER DIAL FOR REGULATING WHEEL SPEEDS

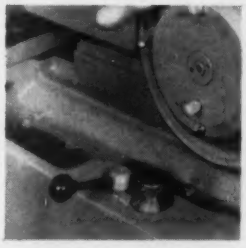
INFEED HANDWHEEL

REGULATING WHEEL SPEED CHANGE HANDWHEEL

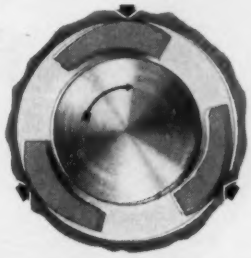
INFEED LEVER

*REGULATING WHEEL TRUING DEVICE CONTROLS

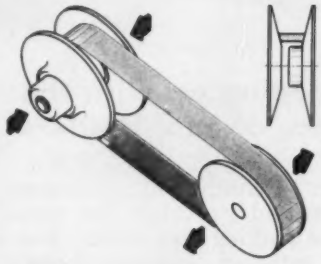
*Plain Hand Truing Attachment for Regulating Wheel is Standard Equipment.



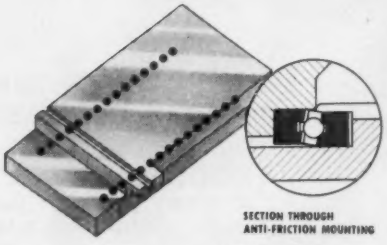
* **Regulating wheel truing controls;** a five position lever, and a rate selector knob are conveniently located.



FILMATIC grinding wheel spindle bearings are still the best in the machine tool industry; no fuss, no bother.



Smooth regulating wheel drive through variable pitch sheaves; infinite number of speeds, handwheel selected and tachometer indicated.



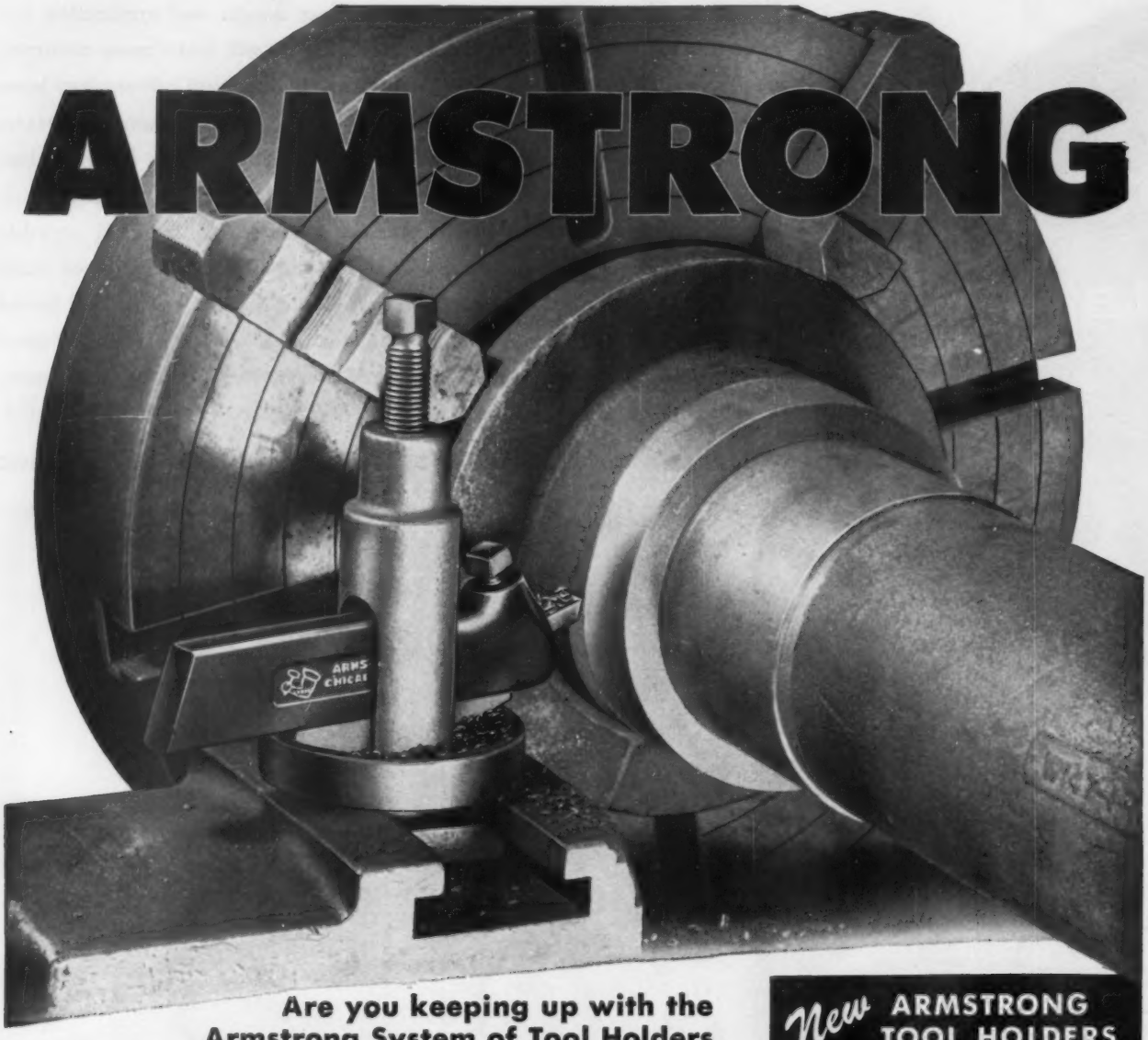
Precision anti-friction slide under regulating wheel unit; split-hair dial adjustment is translated precisely to infeed movement.

CINCINNATI

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

ARMSTRONG



Are you keeping up with the Armstrong System of Tool Holders

Doubtless you are daily using ARMSTRONG TOOL HOLDERS that have been in continuous operation for many years. This is sound practice, for this means added profits without added tool costs. But to become complacent, so satisfied that you forget your ARMSTRONG TOOL HOLDERS, is unwise. The "Armstrong System" is a growing thing, with new types and sizes of ARMSTRONG TOOL HOLDERS constantly being developed to more effectively meet new machining conditions, or to take advantage of newly developed cutting materials.

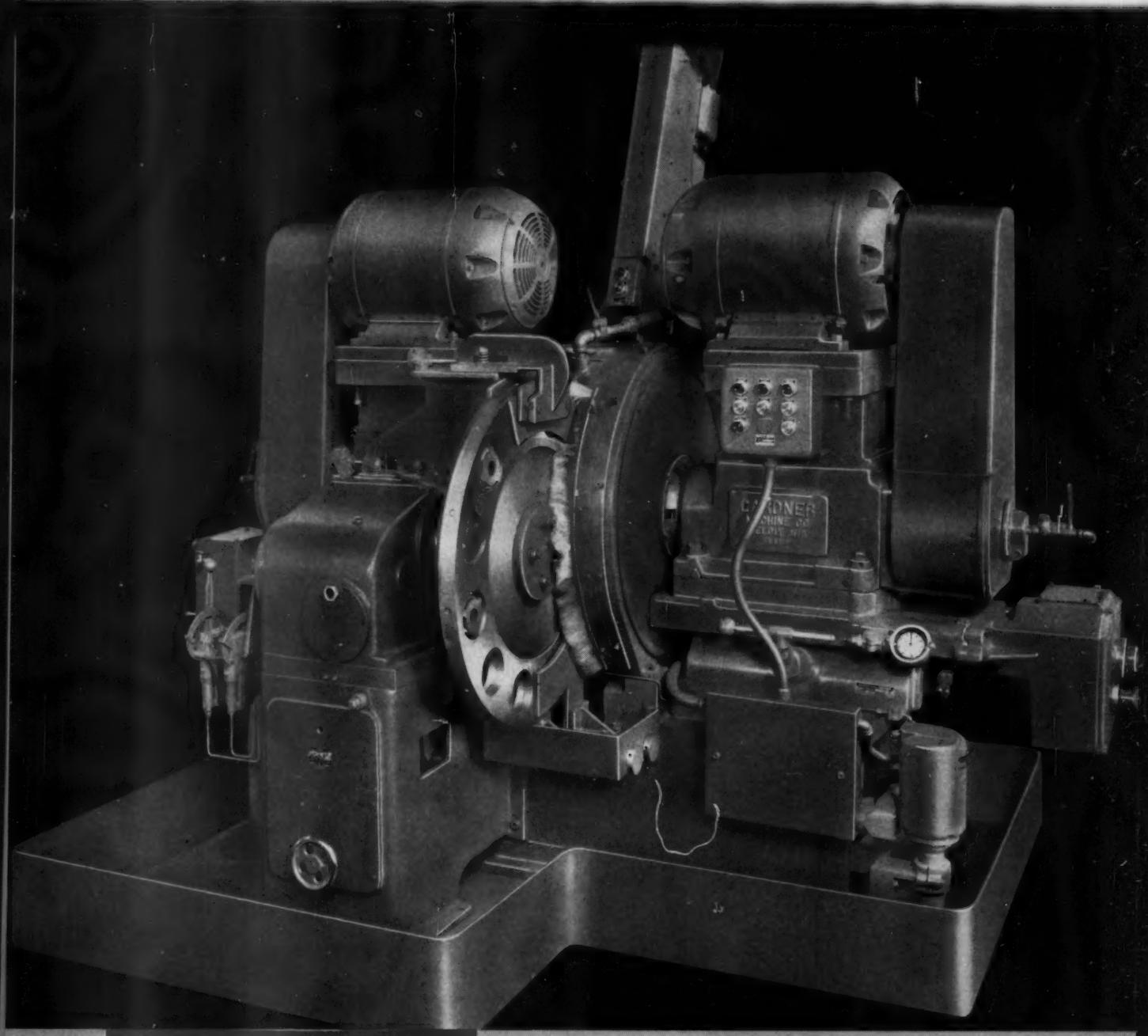
With modern ARMSTRONG TOOL HOLDERS for each operation, you can greatly increase speeds and feeds. You can lower machining cost and further increase profits.

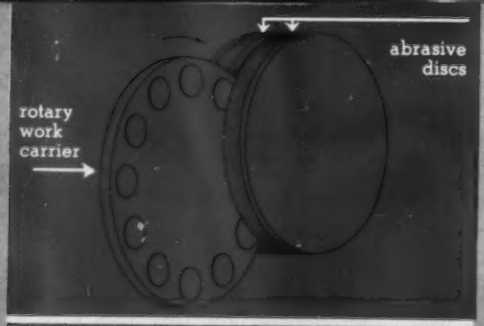
If you haven't kept up with the "Armstrong System" write for an ARMSTRONG Catalog and check to see that you are using the most efficient ARMSTRONG TOOL HOLDER for each operation on all lathes, planers, slotters and shapers.

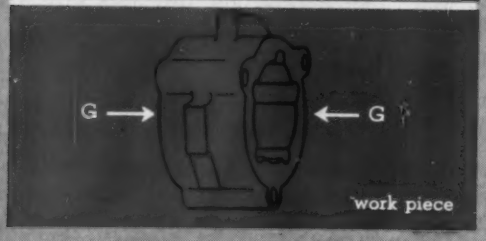
New ARMSTRONG TOOL HOLDERS
ARMSTRONG Spring Form Threading Tool Holder
ARMSTRONG Spring Cutting-off Tools
ARMSTRONG Carbide Tool Holders for Carbide-Tipped Cutters
ARMSTRONG "C-A" Tool Holders for ARMALOY (Cast-Alloy) Cutter-Bits

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.







GRIND TWO PARALLEL SURFACES IN ONE OPERATION

work data	
MACHINE	Gardner No. 125-30" Double Spindle Grinder with rotary work carrier.
PART	Cast iron valve housing for power steering mechanism.
PRODUCTION	600 pieces per hour.
STOCK REMOVAL	.100" overall.
TOLERANCES	.002" for parallelism; .005" for uniformity.
ABRASIVES	2 Gardner Yellow Rim Wire-Lokt Discs.

GARDNER

precision disc grinders

GARDNER MACHINE COMPANY

Beloit, Wisconsin, U.S.A.

135M

Users tell you how

These two cut-off

On-the-job reports prove the Norton rubber bonded R50 and resinoid bonded

For wet cutting

Users' reports on how the Norton R50 adds the profit-boosting

"TOUCH of GOLD"

- **Wheel life tripled**
  Massachusetts tool manufacturer says R50 wheel, cutting-off high speed steel tap stock, lasted three times as long as best competitive wheel. Job required very smooth cut, with no burr or burn.
- **Best in every way**
  Illinois maker of combination doors and windows reports R50 wheel produced best quality cut, fastest cutting action, longest life for cutting extruded aluminum frames.
- **Longer lasting, superior cutting**
  Rhode Island oil seal manufacturer reports R50 wheel, cutting-off stainless steel, gave considerably longer life with better quality cut than any other wheel.
- **70% more durable**
  New York steel company says R50 wheel beat durability records of two best previous cutting-off wheels by 70%. Work was on high speed and carbon tool steels.
- **First among four**
  Pennsylvania manufacturer of coal mine bits reports R50 best wheel used for cutting alloy steel bit stock. Far superior, in quality of cut and durability, to three other wheels tried.
- **Best wheel ever used**
  New Jersey sporting goods manufacturer, using R50 for cutting off tubing for golf club shafts, rates this wheel far above all others for performance and economy.

The Norton R50 rubber bonded cut-off wheel is designed especially for wet cutting of ferrous bar stock up to 6" diameter. It is the wheel to use where quality of cut, without burning, is important. Built-in chip clearance — unusual in this type of wheel — is one of many "Touch of Gold" advantages for better cutting performance and longer wheel life.

Is wet or dry cutting best for YOU? — Ask your Norton distributor

Are your cutting-off jobs marred by excessive burring or burning? Are you case-hardening the work, so that it causes tool breakage? Are you wearing out your wheels too fast on high production runs? Are you looking for finished cuts — and not getting them?

If you're bothered by any of these cutting-off problems, perhaps you ought to check your methods as well as your wheels. You may, for example, be dry cutting, when wet cutting would be more efficient — or vice versa.

Your Norton Distributor's abrasive specialist, or your Norton Abrasive Engineer is ready to give you practical information on cut-off *methods* — information that can save you money every day.

See your Distributor, or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

wheels top all others

B9 wheels save time and money on the widest range of wet and dry applications

For dry cutting

Users' reports on how the Norton B9 adds the profit-boosting

"TOUCH of GOLD"

- **Five times better**
  California naval shipyard re-orders B9 wheel for aluminum cutting jobs. Reason: B9's 5 to 1 superiority over best previous wheel.
- **100% more cuts**
  New Jersey foundry switched to B9 wheels for cutting "Christmas tree" risers from precision castings, after tests in which B9 gave twice as many cuts.
- **Gave a 10 to 1 advantage**
  Indiana tool company praises B9 wheel as easily the best ever run for cutting-off miscellaneous hardened tools, delivering a 10 to 1 advantage over best of competition.
- **Best general purpose wheel**
  Massachusetts manufacturer of molded rubber products reports the B9 best all-around cut-off wheel in their experience. Chief jobs were cutting various types of steel up to 3" diameter.
- **Unbeatable on Inconel**
  Pennsylvania bearings company says it found no other wheels to compare with the B9 for cutting Inconel bar stock. Outperformed competitive wheels on all counts.
- **565 more cuts**
  Massachusetts manufacturer of textile equipment reports B9 wheel produced 700 cuts on 1 x ½ x ⅛" steel channels. This topped previous wheel's record of 135 cuts by 565 — for five times longer wheel life.

The Norton B9 resinoid bonded cut-off wheel is recommended for high production dry cutting jobs, especially where fast rate of cut is essential. It is made with either smooth sides or the rough "F" sides for more clearance in the cut. It will give you long, economical "Touch of Gold" performance in the widest range of ferrous and non-ferrous applications.

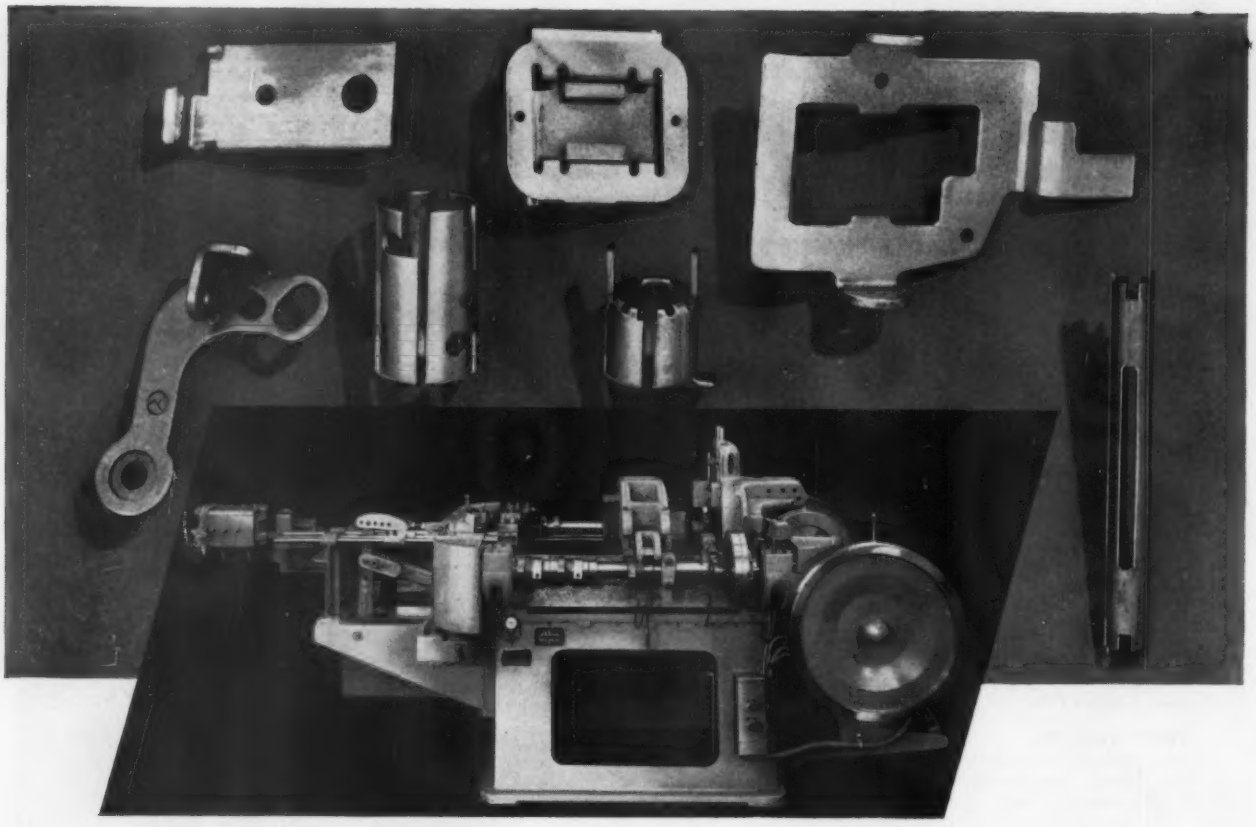
Making better products...to make your products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

W-1600



FOR *AUTOMATIC* PRODUCTION OF *PRECISION* STAMPINGS

THE U. S. MULTI-SLIDE®

In the production of precision stampings, every secondary operation, every inspection, every handling helps to send your costs UP! You can keep these costs at a minimum by using U. S. Multi-Slide Machines to produce parts rapidly, accurately, and *complete* in a single operation. The illustration above shows some typical parts which have been produced in this manner in U. S. Multi-Slides. These parts—of copper, aluminum, brass and steel—illustrate the variety of operations, including piercing, trimming, swaging, coining, blanking and forming, which can be performed in any combination in a U. S. Multi-Slide. Many of these parts formerly required costly secondary operations and intermediate inspections. Now they are produced uniformly and to close tolerances in a single, high-speed operation.

U. S. Multi-Slide Machines are built in four sizes. Illustrated above is the No. 33 Machine, with capacity for material up to 2½" wide and feed length adjustable up to 12½". If your program involves the production of precision stampings, investigate the labor-saving, time-saving features of U. S. Multi-Slides.

Ask for a copy of Bulletin 15-A containing complete specifications.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

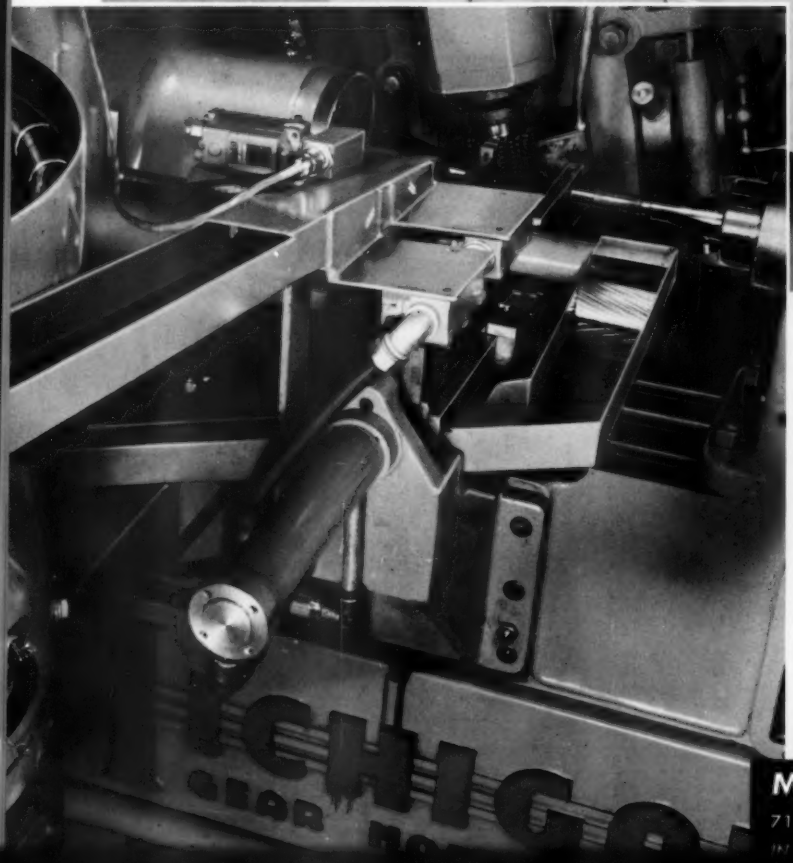
Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

Announcing

This Month's

GEAR PIX



THE NEW ULTRA-SPEED 5″ GEAR HOBBER

New in principle, this Michigan "Ultra-Speed" No. 1445 hobber hydraulically crossfeeds the hob across the work at the helix angle of the gear. Hydraulic plunge-feed, tail-stock, and hob-shift speed up the hobbing cycle. Fast, simple setup for short runs. Can be equipped with automatic hopper feed for long production runs. Hobs helical or spur gears up to 8 pitch, 4″ face and 5″ diameter at hob speeds up to 570 rpm. Ask for bulletin LH-54.

MICHIGAN TOOL COMPANY

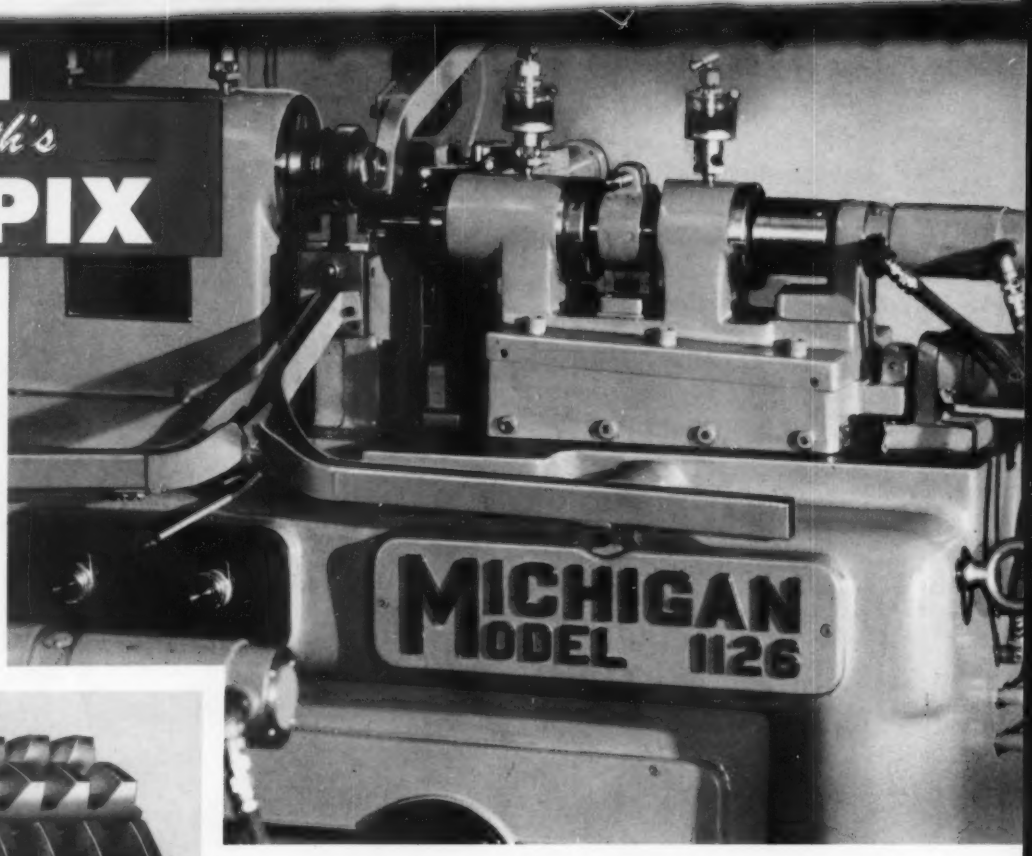
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO., LTD., WINDSOR, ONT.

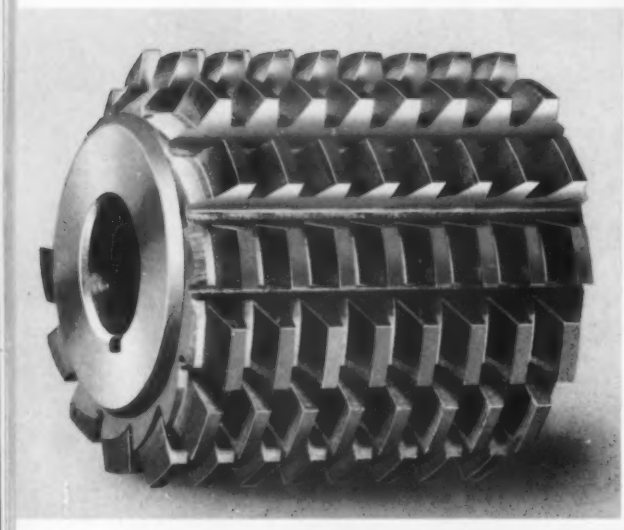
Over

This Month's

GEAR PIX



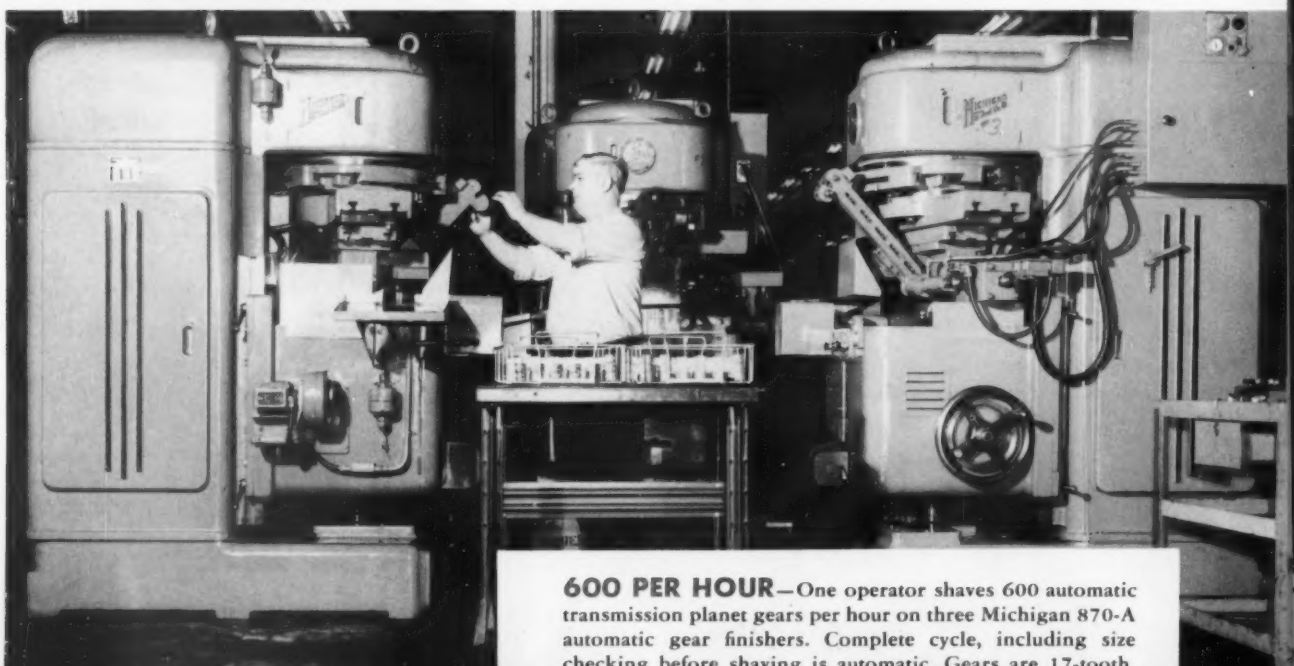
AUTOMATED SPEEDER—The operator just listens to the speeding gear to learn whether it is ok—then flicks the lever to send it down the ok or reject chute. Gears are hopper fed down a chute and automatically loaded and unloaded. Hoppers are mounted behind a soundproof wall.



INCREASE HOB LIFE—Hob life can be increased as much as 225% by reducing the amount of stock that is removed per sharpening.

For instance, a 7 pitch hob where .030″ stock must be removed each time can only be sharpened 12 times. If .020″ stock is removed, it can be sharpened 19 times. But if sharpening requires only .010″ stock to be removed at a time, the 7 pitch hob can be sharpened a total of 38 times.

There are times when it is advantageous to get maximum production between sharpenings, even though it does require excessive stock removal. Each individual case should be decided on its own merits.



600 PER HOUR—One operator shaves 600 automatic transmission planet gears per hour on three Michigan 870-A automatic gear finishers. Complete cycle, including size checking before shaving is automatic. Gears are 17-tooth, 1.2922″ pitch dia., 1.123″ face, 20° L.H. helix.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

IN CANADA: COLONIAL TOOL CO. LTD. WINDSOR, ONT.

Over

IN CANADA, COLONIAL TOOL CO., LTD., WINDSOR, ONT.

HEAT TREATING BOOSTS PRODUCT PREFERENCE

Sales Up 300%

...increase credited to ALLIS-CHALMERS INDUCTION HEATING

JAMBOR Tool & Stamping Co.
Milwaukee 10, Wisconsin, U. S. A.
BULL DOG AUTOMOTIVE PRODUCTS

Allis-Chalmers Mfg. Co.
Box 501
Milwaukee 1, Wisconsin

Attention: Mr. Ottmar W. Noeske,
Induction Heating Section

Gentlemen:

For eighteen years we used a special low carbon steel in our king bolts. The great wearing qualities of this steel make heat treating unnecessary. However, even though it will outlast any treated steel, it is file soft.

Naturally, our competitors made an issue of this fact.

To remedy the situation we decided to use a higher carbon content steel and treat our king bolts with the most advanced equipment on the market -- an Allis-Chalmers Electronic Induction Heater.

Since this heater's installation eight months ago, increased preference for our king bolts has been amazing. Sales are up 300%!
In addition, we've cut material costs by 10%.

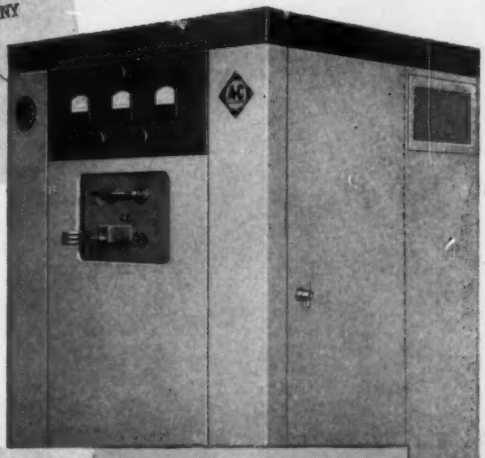
We know this is the type of success story you like to hear and, of course, we're happy to be able to say it happened to us.

Yours truly,

JAMBOR TOOL & STAMPING COMPANY

E. L. Pressinger,
Vice president

ELP:cz



Jambor reports selective control of hardening and penetration with their 20-kw Allis-Chalmers heater. White line indicates hardened steel. Black area around it is merely plastic wrapping to increase visibility of etched surface.

If your production involves hardening, soldering, annealing, brazing and/or heating — find out about Allis-Chalmers induction heating. See how you can increase preference for your products, boost output, decrease costs and cut rejects.

Get productive flexibility, too. Setting up these heaters to handle various jobs is merely a matter of changing a single coil. You can handle small, odd-lot work with almost as much efficiency as long production runs.

For all the facts, contact your nearest A-C District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4501

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

IN CANADA: COLONIAL TOOL CO., LTD., WINDSOR, ONT.

BALANCED *Action*

In Special Application Taps, Too!

It pays to use *Special Application Winter Taps* when working with aluminum, plastics, zinc, cast iron. Like all Winter taps, *they operate with balanced action.*

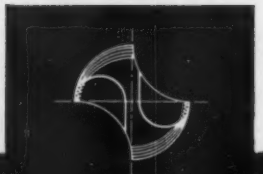
WINTER BROTHERS COMPANY, Rochester, Michigan, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Chicago • Dallas • San Francisco • Los Angeles • Division of National Twist Drill & Tool Co.

CALL YOUR WINTER DISTRIBUTOR

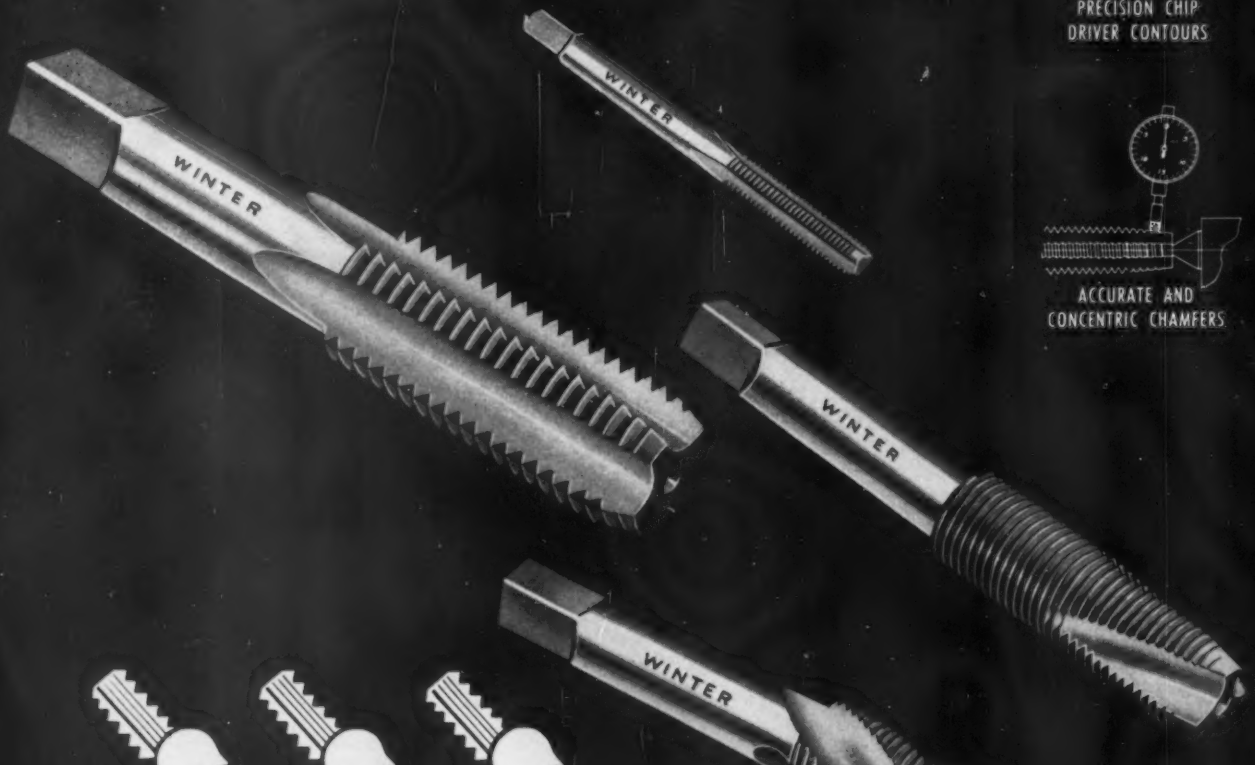
EXACT FLUTE SPACING

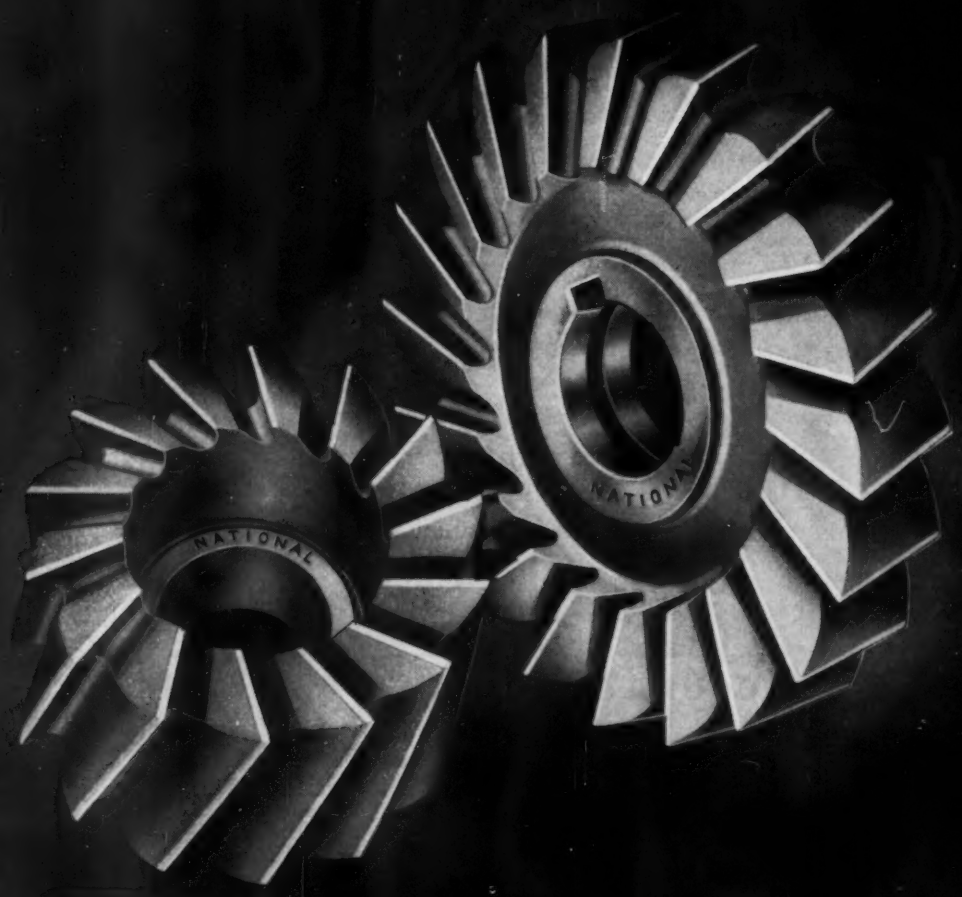
UNIFORM FLUTE CONTOURS



PRECISION CHIP DRIVER CONTOURS

ACCURATE AND CONCENTRIC CHAMFERS





National

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

Long Life Between Grinds

Give yourself the edge in production economy. Use Milling Cutters with the dependable National cutting edges, designed with the proper rake angles for your work.

National milling cutters in stock cover a very wide application range. Also, National will design and build "specials" to fit your needs.

CALL YOUR NATIONAL DISTRIBUTOR

NATIONAL TWIST DRILL AND TOOL COMPANY

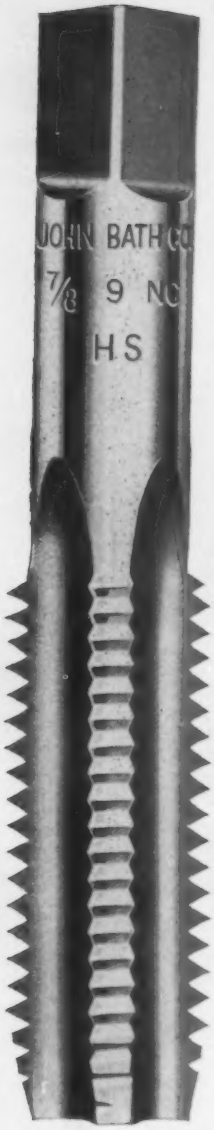
Rochester, Michigan, U. S. A. Distributors in principal cities. Factory Branches: New York • Detroit • Chicago • Dallas • San Francisco • Los Angeles

TWIST DRILLS • REAMERS • COUNTERBORES • MILLING CUTTERS • END MILLS • HOBS • SPECIAL TOOLS

BATH TAPS

Make Better Threads

because they are



Insist on BATH TAPS for BETTER THREADS

SHARP

Bath Taps have teeth with sharp cutting edges, capable of "putting the bite" on the toughest materials.

UNIFORM

Bath Taps of the same size, are exact duplicates . . . on the same order, or on a re-order.

ACCURATE

Threads are "right on the nose" . . . because Bath Taps have the proper pitch diameter, lead and angle.

RUGGED

Behind the ruggedness of Bath Taps, is the experience of years in the manufacture of tools that can "take it".

CONTROLLED

Every step in Bath Tap manufacture is controlled . . . rigid check-ups and routine inspections guarantee high performance standards.

DEPENDABLE

Bath Taps are especially heat treated before "grinding from the solid", to assure accuracy and dependability.

Bath engineers check every detail, to see that all Bath Taps are conditioned to do the best threading job for your requirements.

JOHN BATH & CO., Inc.

22 Grafton St., Worcester, Mass.

PLUG CYLINDRICAL AND THREAD GAGES • RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

THIS PLANT HAD THE RIGHT IDEA

but not the *Right machine*

The Right Machine can make a whale of a difference. Sometimes it's the difference between showing a profit or just getting by. Often (in a machine job shop) it's the difference between getting the order or losing it.

Remember, the true cost of a machine is entirely dependent upon its output. If you don't have the right machine on your job, it may pay you to see that your competition doesn't get one first.

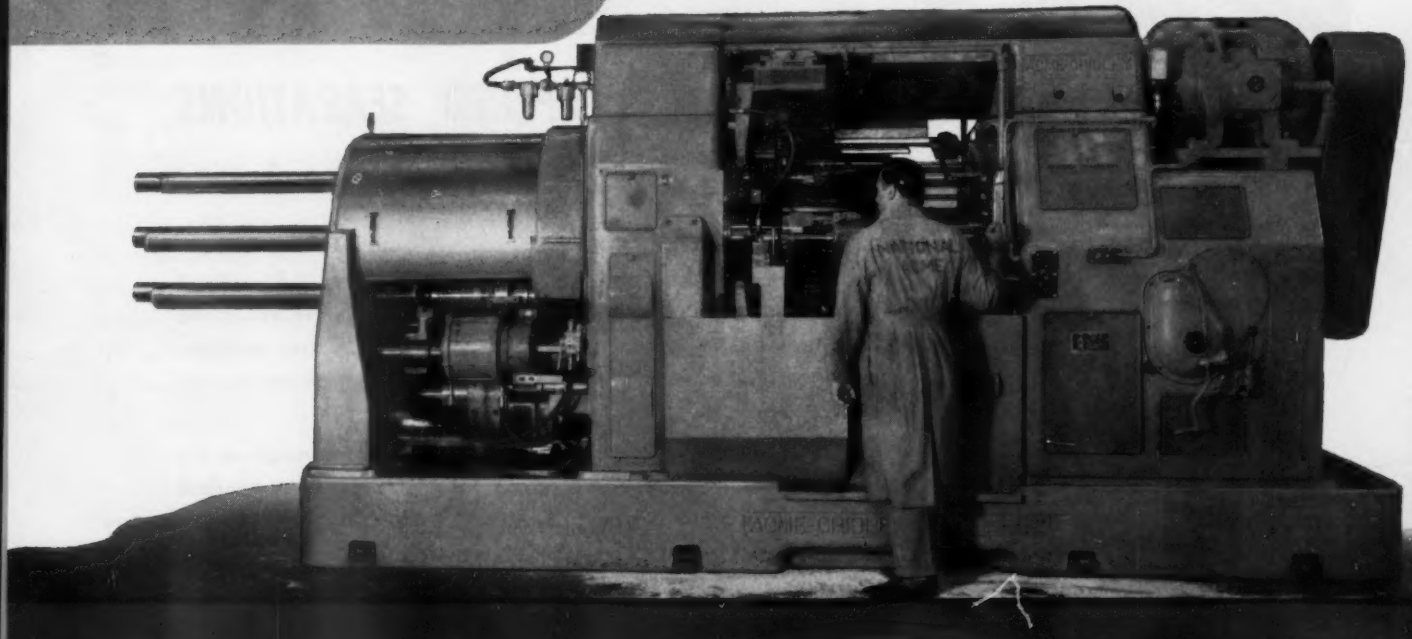
CHANGING FROM 4-SPINDLE TO 6-SPINDLE OPERATION, THIS PLANT NOW SAVES PLENTY ON *BIG PARTS*

In a large screw machine products plant, the RIGHT machine for the job was a *six-spindle* bar automatic *large enough to handle up to 6" bars.* The 4-spindle machine they were using was large enough, but they needed the extra tooling capacity that 6-spindle operation could give them.

Could National Acme solve their problem? National Acme not only could—but did. Today this plant has an ACME-GRIDLEY "BIG 6-INCH SIX"—the largest six-spindle bar automatic ever installed in a screw machine products plant.

Today they enjoy all the production benefits on large parts that six-spindle tooling is giving them on smaller ones. The "BIG 6-INCH SIX" is breezing along day after day performing all operations simultaneously, with only the time required for the longest single cut controlling output. And it's doing it with just *one machine setup.*

We'll be glad to study your operation and give you our recommendation, with no obligation to you.

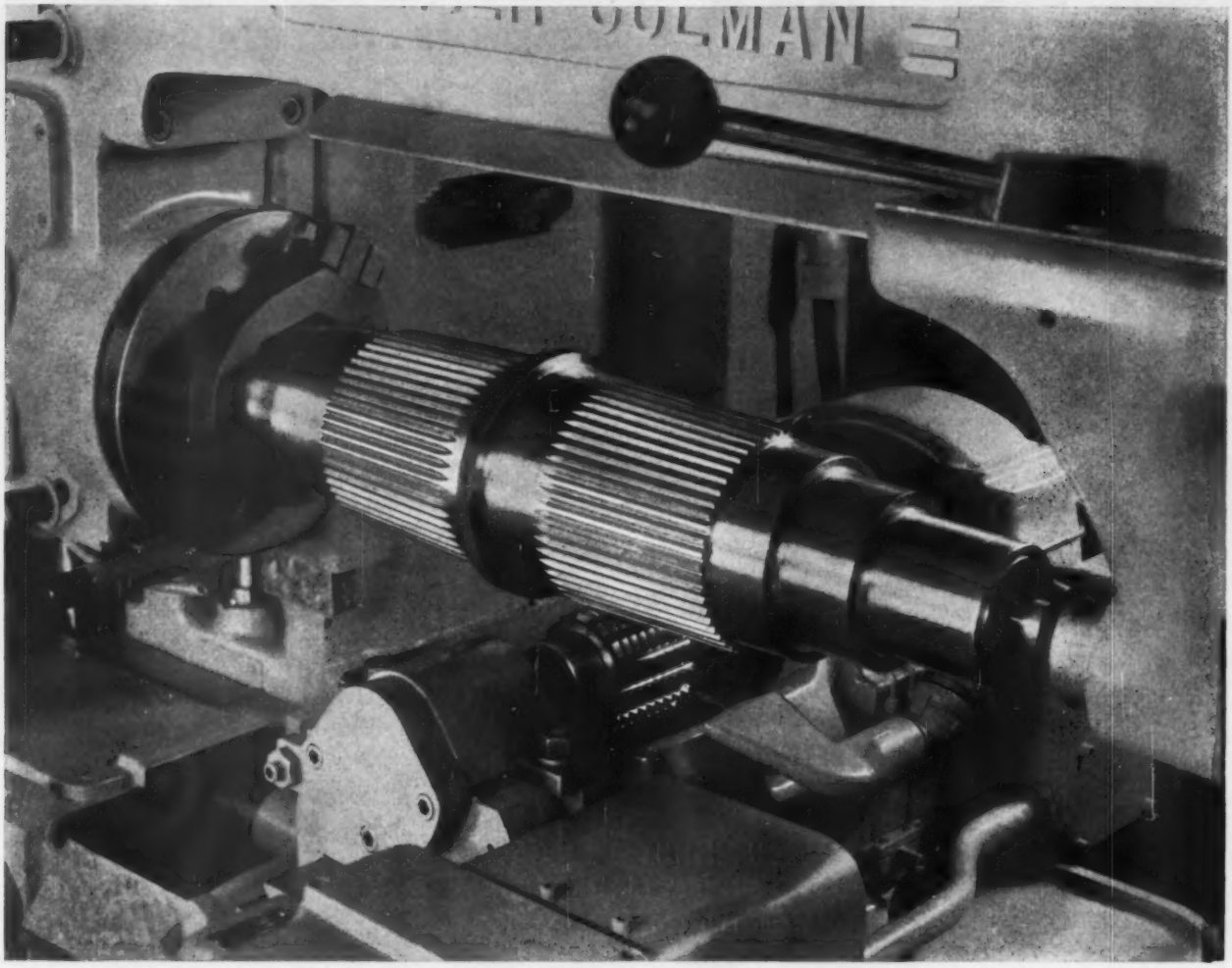


Remember: You can't do **TODAY'S** job – with **YESTERDAY'S** tools – and make a profit **TOMORROW**

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing.

The NATIONAL ACME COMPANY

171 EAST 131st STREET • CLEVELAND 8, OHIO.



HEAVY TORSIONAL DRIVE USES TAPERED SERRATIONS

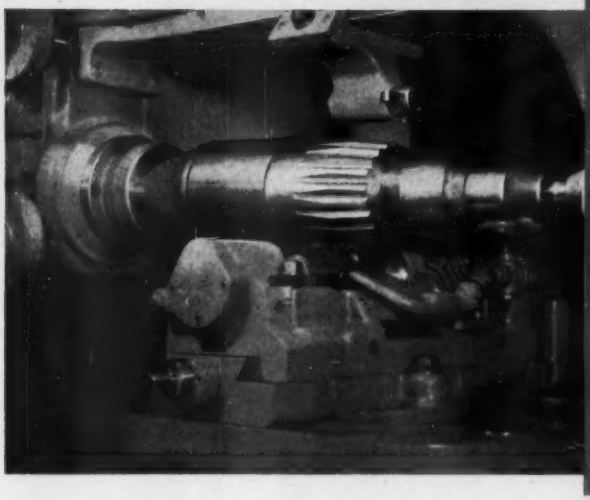
Hobbed On Specially Arranged Machines

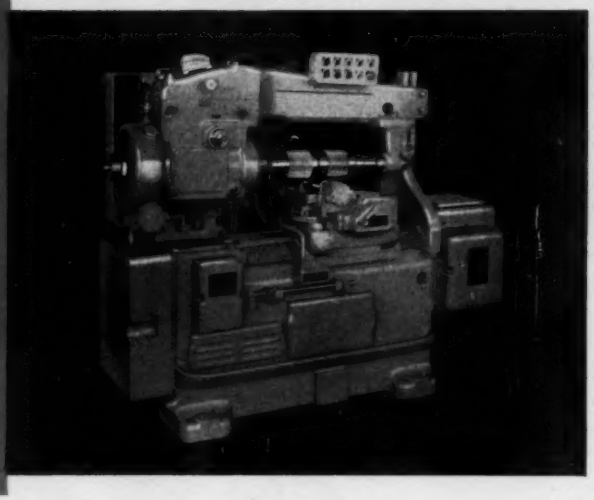
work slide and overarm swivel up to 5°

This Barber-Colman No. 16-16 Hobbing Machine is specially designed and arranged for hobbing tapered serrations. By swivelling the work slide up to 5° to obtain the desired cutting angle, several different tapers may be hobbed on the same machine. Once the proper set-up has been made, hobbing of tapered serrations proceeds according to standard hobbing technique.

Other than the special swivel arrangement on the work slide, universal joint on the worm shaft, and a cut-away outboard overarm support, this machine is of standard design and illustrates the practicability of adapting special work to standard hobbing techniques.

When not in use hobbing tapered serrations, this machine can be used for standard spur or helical gear work and straight splines. It is equipped with an Automatic Hob Shifter for maximum hob life.





metal-to-metal fit, wear compensation

Tapered serrations provide one of the best holding means for drives which have heavy and frequently-reversing torsional loads. The metal-to-metal side bearing fit eliminates relative rotation between members, and the taper provides for take-up to compensate for wear. Typical applications are heavy reversible drives such as tractor axles and hubs, and high-frequency reversible drives such as steering shafts and Pitman arms.

involute tapered serrations

Both involute and straight-sided tapered serrations may be produced by this hobbing method. The major illustration shows the hobbing of 10/20 diametral pitch involute serrations, ¾" taper per foot O.D., 54 teeth, and 6" major diameter. These teeth have a generated form with tapered root and outside diameter, the form changing continuously from the large to the small end. The mating part is swaged slightly undersize and the desired contact is obtained as a result of cold working the material in fitting the members. The swage is usually hobbed by the same set-up as the tapered shaft.

straight-sided tapered serrations

The second illustration shows the hobbing of straight-sided serrations using a single-position hob. These teeth are hobbed in 2-cuts and have straight sides with constant-width tooth spaces which permits the mating part to be broached to size after reaming to the correct taper. The internal mating part is broached one tooth at a time, providing a metal-to-metal fit which is not dependent upon cold working the material. Should looseness occur due to wear, it is taken-up on the tapered sides of the teeth.

Barber-Colman Engineers developed the special single-position hob for producing tapered serrations with a constant space width. They welcome special applications where this type of drive is an advantage and will be glad to furnish estimates on both hobs and machines for economically producing tapered serrations. Just send prints or samples marked for the attention of our Hob Engineers.

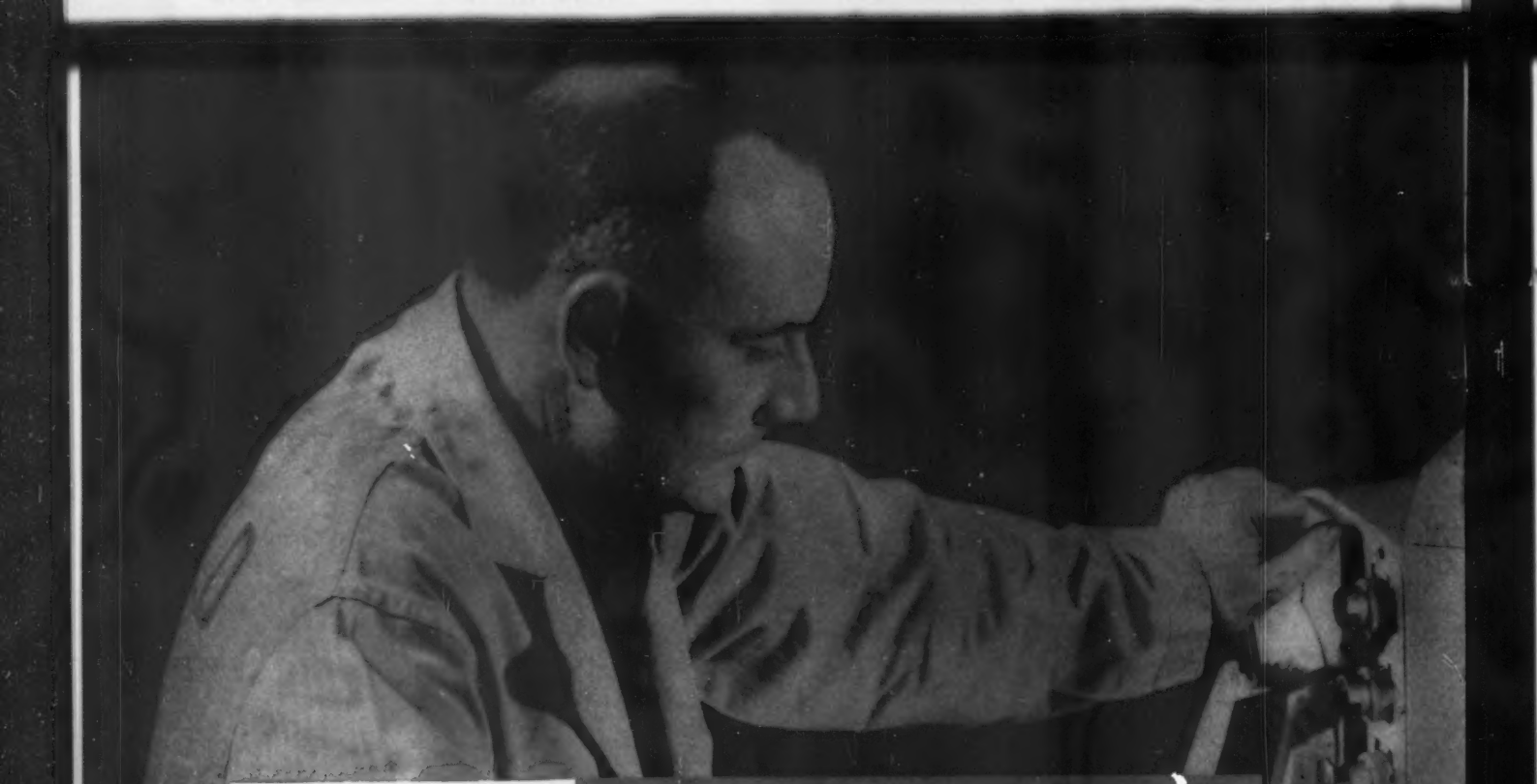
HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

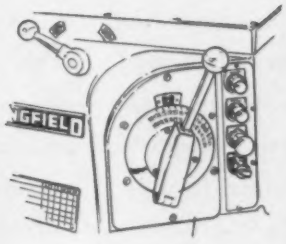
BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 611 ROCK STREET, ROCKFORD, ILLINOIS

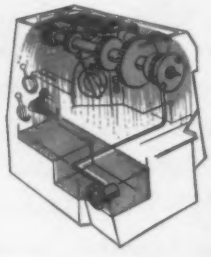
HOBS AND MACHINES SINCE 1911





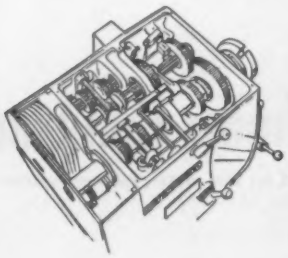
it does more work (and the operator does less)

Simple, least-effort controls: color-coded dial selection of 24 spindle speeds; four levers for totally enclosed gear box; tailstock wheel set at angle for easiest operation; wheel has two speeds, one for normal operation, one for drilling; chip pan on casters for quick movement to insure cleaner, safer floors.



it runs cooler

Continuous oil-mist lubrication of all headstock gears does more than lubricate; it carries heat away into large sump in headstock leg. Cooler head minimizes distortion during warmup; markedly improves accuracy and stability of work alignment.



it saves power, cuts wear

The headstock has only four gears in mesh at once for any speed. Other gears run free; flywheel action adds to stability. No "pass-through" gears in shifting.

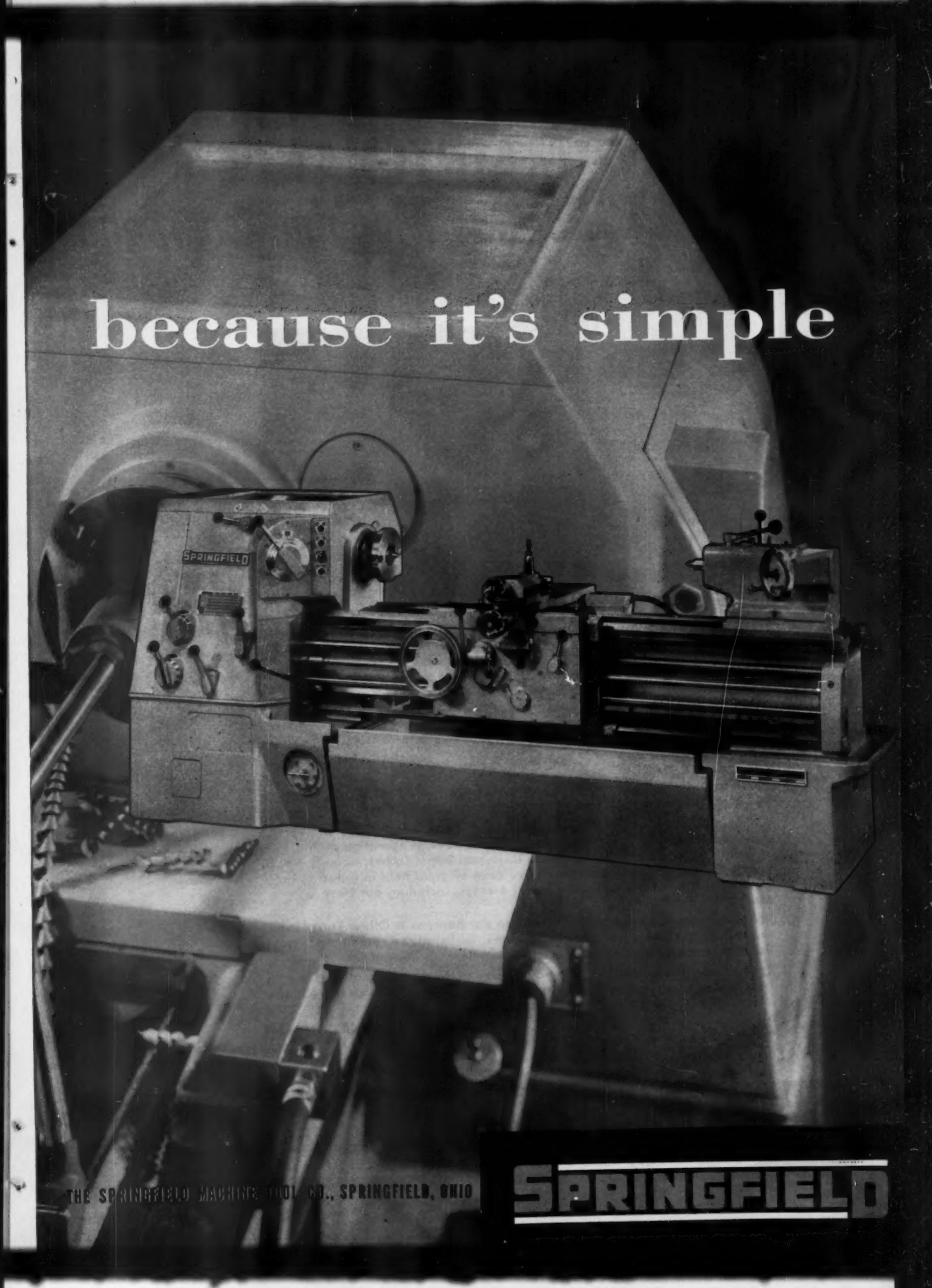
it promotes cleanliness—and safety

Clean modern design encourages good shop practices, better maintenance; builds pride in workmanship and better quality in work produced.

Engine and toolroom lathes: swings 14″ to 32″
Contouring and reproducing lathes: swings 14″ to 32″
Universal vertical grinders: swings 21″ to 52″

write for name of your nearest dealer

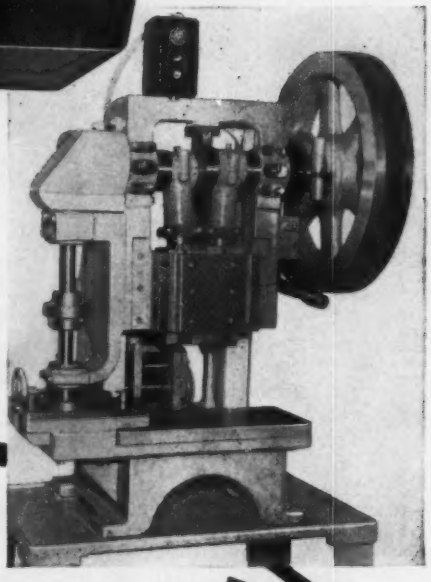
67TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS


because it's simple
SPRINGFIELD
THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO
SPRINGFIELD

"TROUBLE-FREE PERFORMANCE"
"LOW MAINTENANCE"
...At Perkins Machine Company

BARDONS & OLIVER No. 7
Universal Turret Lathe

Pictured at the right is the Perkins Machine Company's New Model 3 AAT Transfer Press, parts of which are made on BARDONS & OLIVER Turret Lathes.



Bardons & Oliver, Inc.
1133 West Ninth Street
Cleveland 13, Ohio

Gentlemen:

Perkins Machine Company purchased their first Bardons & Oliver Universal Turret Lathe over thirteen years ago. We now have in operation all three sizes of Bardons & Oliver Ram Type Universal Turret Lathes, namely No. 3, No. 5 and No. 7. These machines have been of great help in reducing the production cost of our complete line of presses, including our New Model No. 3 AAT.

We have always been able to depend on our Bardons & Oliver Turret Lathes to produce to close dimensional tolerances, while, at the same time removing the maximum amount of stock in minimum time.

Ease of operation, together with trouble-free performance, and low maintenance requirements, have made these machines favorites in our shop.

Very truly yours,
PERKINS MACHINE COMPANY

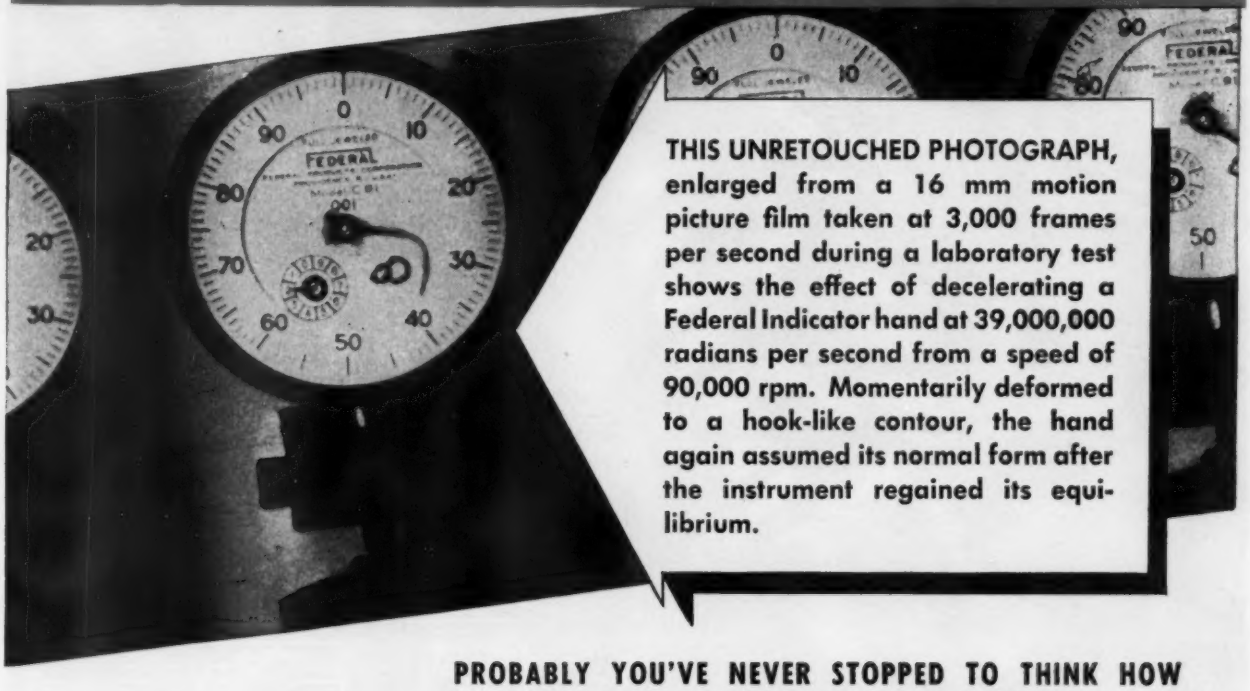
B. W. Perkins, Treasurer

Send for Catalogs describing the No. 3 or No. 5 and 7.

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

What this test means to YOU!


FEDERAL
THIS UNRETOUCHED PHOTOGRAPH, enlarged from a 16 mm motion picture film taken at 3,000 frames per second during a laboratory test shows the effect of decelerating a Federal Indicator hand at 39,000,000 radians per second from a speed of 90,000 rpm. Momentarily deformed to a hook-like contour, the hand again assumed its normal form after the instrument regained its equilibrium.

PROBABLY YOU'VE NEVER STOPPED TO THINK HOW IMPORTANT AN INDICATOR HAND CAN BE...

IT IS NOT JUST CONVENTIONAL MODERN DESIGN that makes the hand on a Federal Dial Indicator look as it does!

This high-speed movie shows one of thousands of tests made in our laboratory in a constant effort TO PRODUCE THE FINEST POSSIBLE DIAL INDICATORS FOR YOU. In this destructive test the hand has been momentarily deformed by an excessive blow on the Indicator's contact point.

You naturally ask why we don't just make a stiffer hand. The answer is that a *heavier* hand would increase the inertia and friction within the Indicator and decrease its sensitivity and accuracy. A *lighter* hand would have less inertia but it would not recover its normal straightness after extreme operating conditions. The hand of a Federal Dial Indicator MAINTAINS ITS NORMAL SHAPE.

Furthermore, the hand on a Federal Dial Indicator IS STATICALLY BALANCED to assure a CONSISTENT GAGING PRESSURE against the workpiece. You get a more sensitive Indicator of GREATER REPETITIVE ACCURACY.

This kind of detailed research is typical of the great care that goes into the design and improvement of Federal Dial Indicators and helps to explain WHY FEDERAL IS THE WORLD'S LEADING MANUFACTURER OF DIAL INDICATORS.

It is also very much worth noting that modern manufacturing techniques and Modern Quality Control have enabled us to sell Federal Dial Indicators AT THE SAME LOW PRICE FOR FIFTEEN YEARS. If you haven't our latest catalog showing the most complete line of Dial Indicators of all styles and sizes, write Federal Products Corporation, 5121 Eddy St., Providence 1, R. I.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL *INDICATING* GAGES

intricately machined MAX-EL alloy steel part shows minimum distortion after heat treatment...

Halliburton Oil Well Cementing Company, Duncan, Oklahoma, selected hot rolled MAX-EL 3½ bar stock for the valve shown. It's an important part of their 5⅞" tester, used to sample fluids or gases during drilling operations, sometimes 15,000 to 20,000 feet below the surface.

The valve is machined in the annealed condition and then heat-treated. Even though it varies considerably in thickness, no distortion problems are encountered in this MAX-EL part.

Try MAX-EL in your shop. You'll like its better machinability, freedom from distortion and over-all quality. And you'll get longer tool life . . . more pieces per grind. Call Crucible for immediate warehouse delivery of MAX-EL steels.

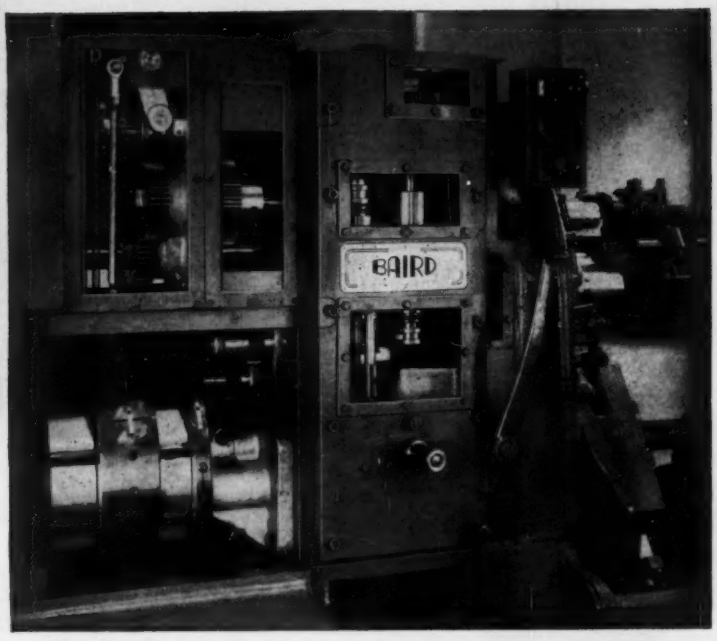
CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **ALLOY STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

. . . IF IT'S A HIGH PRODUCTION PROBLEM . . .

ASK BAIRD ABOUT IT



HERE'S BAIRD'S

Guinea Pig

WHERE WE WATCH OUR OPERATIONS . . . *FOR YOUR BENEFIT*

One of the features of Baird machines that customers like best is that when they are tooled and put on production . . . they produce. In many cases, however, arrival at that happy result in our customer's plant is by no means as simple as it sounds. Hence our "Guinea Pig" and other special Baird engineering procedures. The "Guinea Pig," as you can see from this photograph, is just that . . . a regular Baird Multiple Spindle Automatic, with plastic windows let into its "hide" at many vital points. By this means we can check details of operation under controlled conditions. Cams, gearing, controls, interlocks, tool slide action, temperatures, lubrication, wear . . . just about every factor in performance . . . is seen, gaged and compared.

And that, we believe, is typical of Baird's whole approach to high production machinery and tooling. For years, people have said "ASK BAIRD ABOUT IT" only because they know we will give them the right answer. Send in your inquiries, gentlemen — we're never too busy to help. Write Dept. AM.

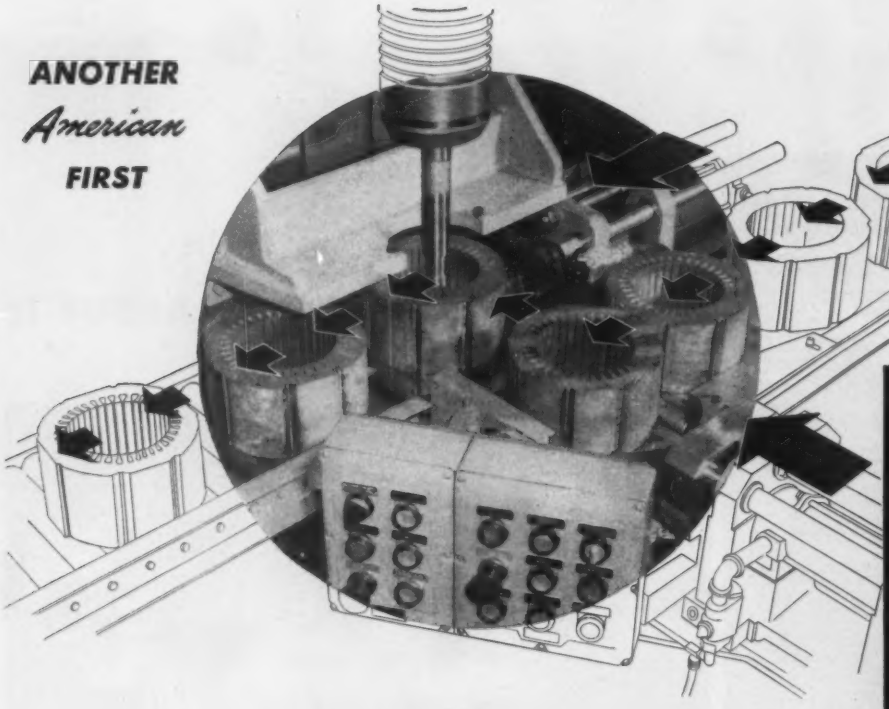
THE BAIRD MACHINE COMPANY

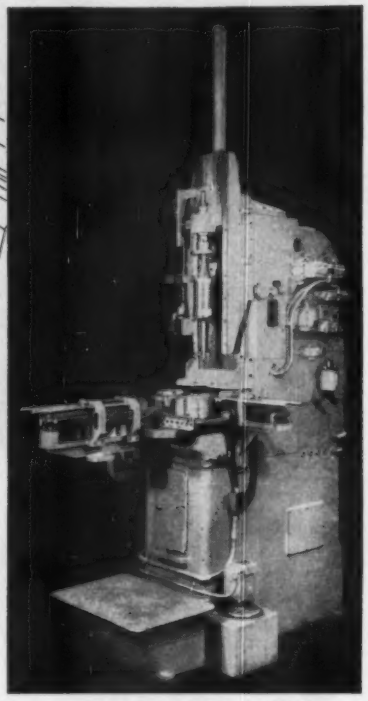
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • SPECIAL AUTOMATIC

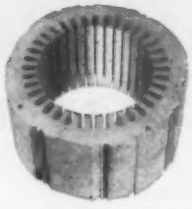
ANOTHER
American
FIRST





...completely AUTOMATED BROACHING

STATOR PARTS BROACHED IN 20 SECONDS



Installed in a conveyor line, this American 3-way broaching machine with a hydraulic broach retriever and electrical controls, broaches the I.D. of stator parts in a 20 second cycle. Parts coming into the machine are automatically shuttled into position, broached, and then discharged back on the conveyor line. Interchangeable broach arbors and broach shells make it possible to broach several different parts of similar size.

BEVEL GEAR BLANKS BROACHED IN 15 SECONDS

Using tooling similar to that illustrated, an American (PD) pull-down machine, installed in a conveyor line, automatically broaches the I.D. of a bevel gear blank in 15 seconds. By using interchangeable broach arbors and broach shells, over 20 similar bevel gear blanks are broached with this set-up.

FOR AUTOMATED OR INDIVIDUAL BROACHING PROBLEMS — SEE *American*

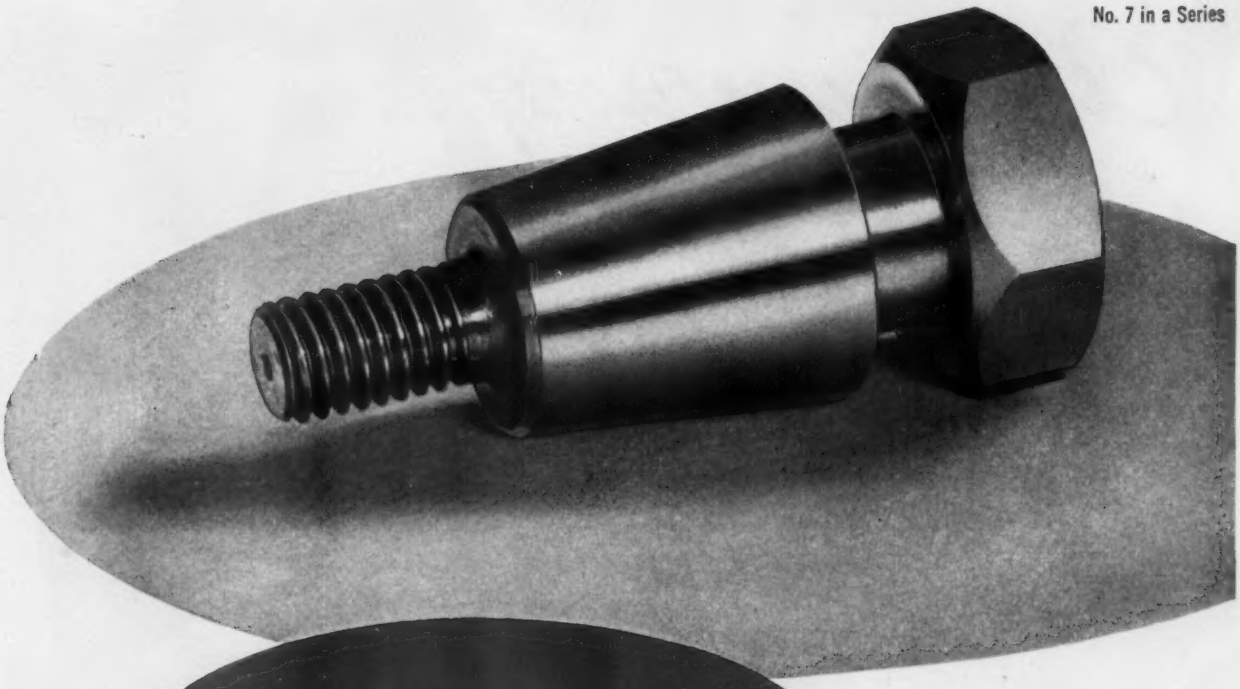
American approaches each broaching problem as part of the complete production cycle. Broaches, fixtures and machines — all designed and built by American — provide a complete broaching service. Let American help you cut your production costs. Send part print or sample to get the solution to your broaching problem. *Ask for Catalog No. 450.*

AMERICAN *American* BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

No. 7 in a Series



carbide service available

data for comparison

Part	Petcock Center
Machine	1⅝" Six Conomatic
Tools	100% Carbide Tipped
Material	X-1112
Stock Size	1" Hexagon
R. P. M.	1562
Time	8 seconds

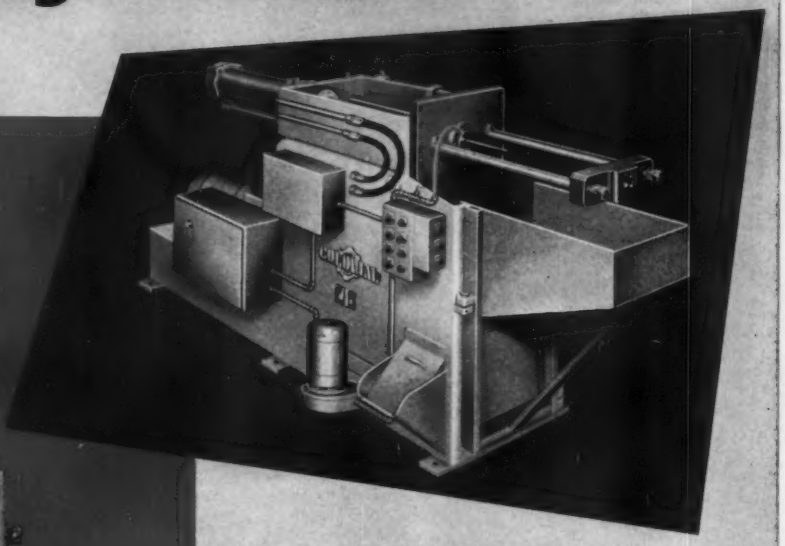
Where conditions are favorable, 100% carbide tool-ups on "Automatics" make HSS tools appear as obsolete as ancient tools of carbon steel.

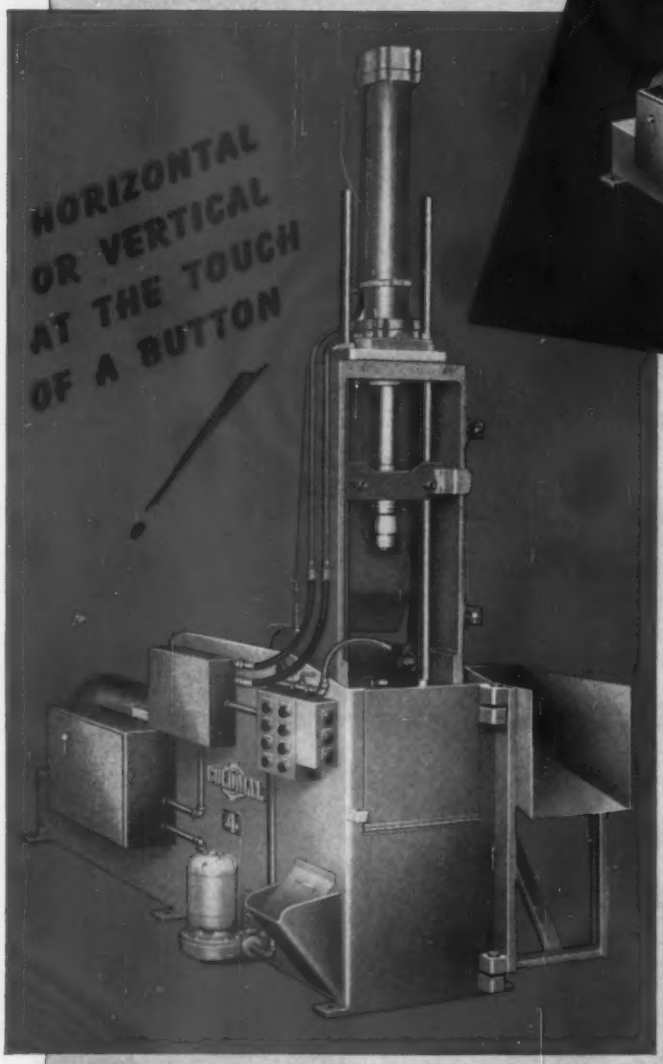
In determining the "favorable" conditions, the Conomatic Carbide Development is of real service to the "Automatic" user. Without risk of production loss or obligation of machine purchase, he gets an eye-witness demonstration of the profit possibilities of 100% carbide tooling to his own work.

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Announcing....

the COLONIAL "4" *Convertible* Broaching Machine





This amazing new Colonial "4" broaching machine is the answer for the shop that requires a broaching machine flexible enough to be changed from horizontal to vertical and back in a matter of seconds.

It is truly multi-purpose—
performing any of four operations:

1. **Push broaching** } **vertical position**
2. **Pull-down broaching** } **vertical position**
3. **Press work** } **vertical position**
4. **Pull broaching.....horizontal position**

Rated capacity is six tons for pull-down broaching, push broaching, or press work, and four tons for horizontal pull broaching. Stroke capacity is 28″ in horizontal and 24″ in vertical position. Guide-bar construction maintains accurate alignment throughout the working stroke for pull-down broaching. Safety interlocks prevent tilting the machine unless the ram is retracted.

Ask for bulletin FW-55 for complete description of the Colonial "4" Convertible.

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13

Hand Finished!

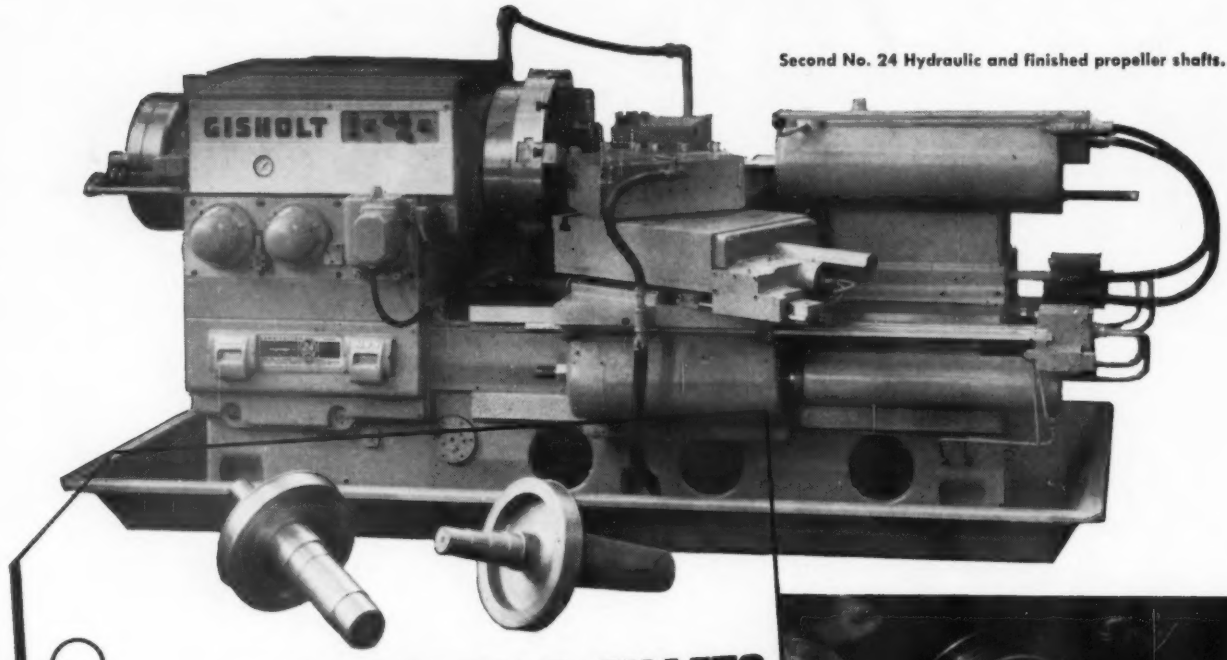
Yes, even in 1955 there are certain jobs that only skilled hands and sensitive human perceptions can do best. Precision thread lapping after grinding is one such job.

Back and forth, back and forth, removing microscopic amounts of metal until the "feel" is right. Then an instrument check, and back to the lap. And so on and on until perfection is attained.

An expensive operation? Yes. But that's why *precision lapped* gages outwear *ground only* gages wherever they are used. When you buy thread gages, always ask, "Are they precision lapped?"

GREENFIELD TAP and DIE CORPORATION

Greenfield, Massachusetts



Second No. 24 Hydraulic and finished propeller shafts.

AIRPLANE PROPELLER SHAFTS AT BARGAIN PRICES!

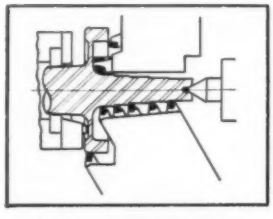
from GISHOLT No. 24 AUTOMATIC LATHES

First No. 24 making chips on small end of shaft.

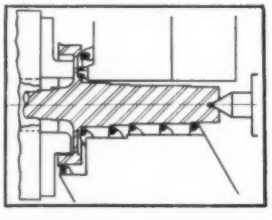
For speed and precision on these hefty drive gear and propeller shafts, production is divided between a pair of Gisholt No. 24 Hydraulic Automatic Lathes. The first machine gets the 275 lb. steel forging for nine different turning, chamfering, and facing operations on the 16″ gear blank and five-shaft diameters. 12 minutes later, the part moves to the second machine where nine tools perform similar work on the other side of the flange. Time again is 12 minutes.

Together, the two No. 24 Hydraulics remove a total of 75 lbs. of material. One man operates both machines. Another tough job handled to perfection by these high production machines.

The Gisholt No. 24 Hydraulic, like the famed smaller No. 12 combines ease of setup with exceptional speed and accuracy—all with fully automatic operation that means low costs on any job. If you have work up to 24″ diameter, you should have full details on the rugged, powerful, No. 24 Automatic.



Tool arrangement for first operation.



Tool arrangement for second operation.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Why CIMCOOL scores with operators

... IT DOES A BETTER JOB AND MAKES JOBS BETTER! This radically new and different cutting fluid cools so fast that workpiece, tools and chips actually stay cool to the touch. And CIMCOOL® is clean—doesn't soil hands ... leaves no hazardous slippery film on hands, work, machine or floor ... and contains no skin irritants.

CIMCOOL wins over old-fashioned coolants because it's a *chemical emulsion*. It replaces all but a few highly compounded specialty oils. It permits faster speeds and it increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So CIMCOOL reduces downtime and cuts labor costs for cleaning and changing.

Let a demonstration in one of your own machines convince you that this revolutionary cutting fluid *makes jobs better* ... and *does a better job*. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you — without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL

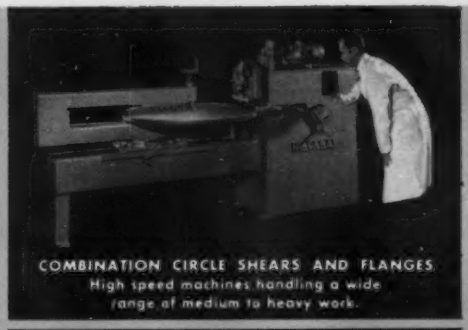
for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

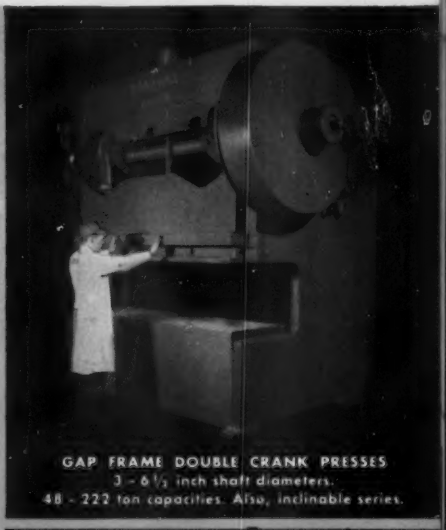
In plate or sheet metalworking...

NIAGARA MACHINES CAN

PRESS BRAKES
50 - 775 ton capacities.

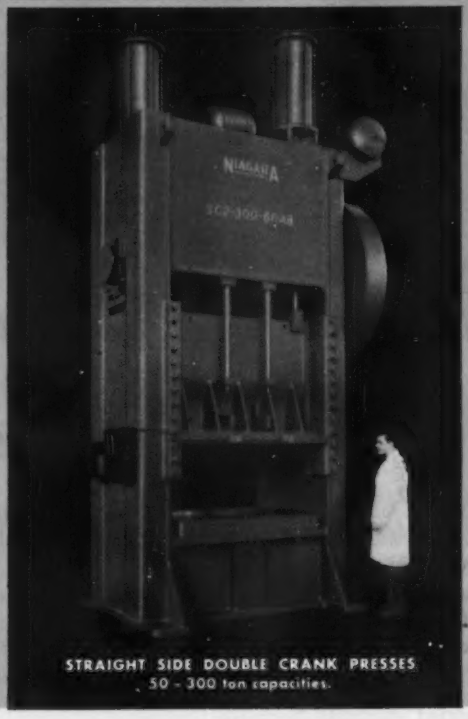


COMBINATION CIRCLE SHEARS AND FLANGES
High speed machines handling a wide range of medium to heavy work.



GAP FRAME DOUBLE CRANK PRESSES
3 - 6½ inch shaft diameters.
48 - 222 ton capacities. Also, inclinable series.

BENDING ROLLS
Hand and power driven for a wide range of lengths and thicknesses.



STRAIGHT SIDE DOUBLE CRANK PRESSES
50 - 300 ton capacities.

SINGLE CRANK OPEN BACK INCLINABLE PRESSES
1¼ - 7½ inch shaft diameters.
7 - 250 ton capacities.

NIAGARA

America's most complete line of presses, shears, machines and

DRUM MAKING EQUIPMENT

ELECTRONIC AUTOMATIC WELDER

FOLDER — BRAKES
- Adjustable Bar Folders
- Universal Folders and Brakes

GROOVERS and SEAMERS

HAND or FOOT OPERATED SHEARS
- Circle Shears
- Foot Curved Shears
- Foot Gap Shears
- Foot Squaring Shears
- Ring Shears
- Rotary Slitting Shears

HAND TOOLS
- Bench Plates
- Bench Shears
- Hammers
- Hand Groovers
- Hollow Punches
- Rivet Sets
- Snips
- Stakes

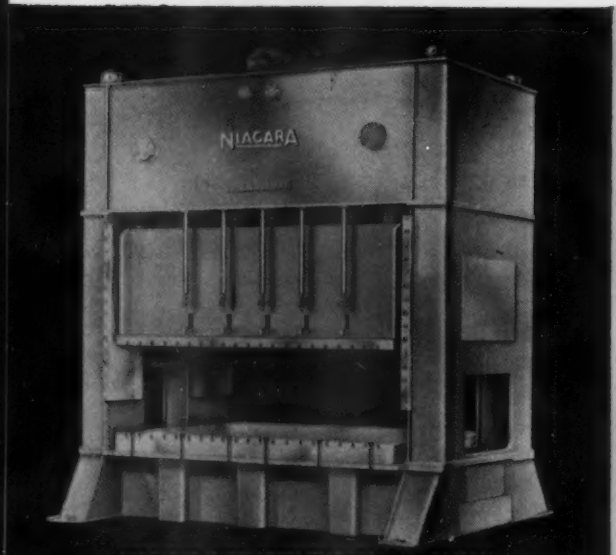
LEVER SHEARS and PUNCHES
- Bar and Rod Cutters
- Combination Lever Punches and Shears
- Lever Punches
- Lever Shears
- Notchers

POWER PRESSES
- Bench Presses
- Foot Presses
- Gap Frame Double Crank Presses
- Gap Frame Single Crank Presses
- Horn Presses — Side Seamers
- Hydraulic Presses
- Inclinable Gap Frame Double Crank Presses
- Inclinable Presses
- Straight Side Double Crank Presses
- Straight Side Eccentric Geared Presses
- Straight Side Single Crank Presses

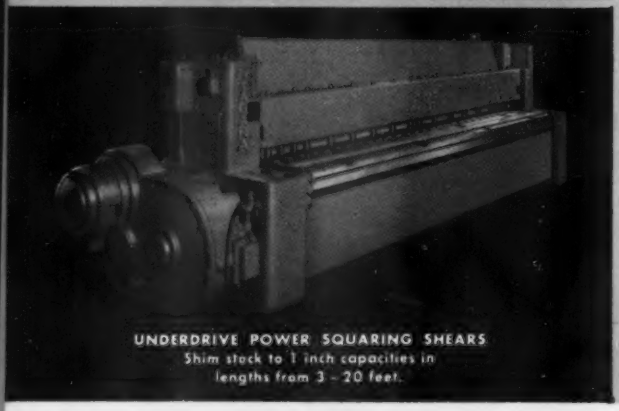
POWER PRESS BRAKES

POWER SQUARING SHEARS
- Economy Line Power Squaring Shears (14 Gage Max.)
- Gap Frame Overdrive Power Squaring Shears
- Light Gage High Speed Power Squaring Shears
- Underdrive Precision Type Heavy Duty Power Shears

DO THE MOST FOR YOU



STRAIGHT SIDE ECCENTRIC GEARED PRESSES
One, two and four-point suspension.
100 - 1000 ton capacities.



UNDERDRIVE POWER SQUARING SHEARS
Shim stock to 1 inch capacities in lengths from 3 - 20 feet.

* MOST EXTENSIVE LINE:

From giant, power-operated machinery to small hand tools

* MOST ADVANCED DESIGNS:

Years ahead in performance through forward-thinking engineering

In the world's largest automotive and appliance plants or the smallest of sheet metal shops, Niagara machines and tools are usually at work "in force."

Batteries of giant presses are teamed up with speedy ring and circle shears. Massive, rugged press brakes stand side-by-side with powerful bending rolls and squaring shears. Versatile lever punches, rotary machines, groovers and seamers . . . all operate together to produce a better product at lower cost. The Niagara lines are "companion lines" of metalworking machines and tools that work together. A Niagara-equipped shop or plant is years ahead in quality and volume of production.

Whatever you require — power presses or hand tools — Niagara is the line that can do the most for you. It is the most complete in the industry . . . the most advanced in engineering. You can consult a Niagara representative with complete confidence of unbiased recommendations. Niagara has the right machines and tools for your requirements.

tools for plate and sheet metal work

NIAGARA MACHINE & TOOL WORKS 1879 75 1954

POWER ROTARY SHEARS
- Power Circle Shears
- Power Circle Shears and Flangers
- Power Ring and Circle Shears

ROTARY MACHINES
- Bending
- Burring
- Combination Machines
- Corrugating
- Crimping
- Edging
- Flanging
- Forming and Curving Machines
- Multi-Drive Table for Rotary Machines
- Setting Down Machines
- Turning
- Wiring

SLIP ROLL FORMERS
- Hand and Power Machines

BRING YOUR FILES UP-TO-DATE WITH INFORMATIVE NIAGARA BULLETINS

Listed at the left are the diversified machines and tools that make up the famous Niagara line. Be sure that you have the latest data on the ones that apply to your type of work. At your request, specific Niagara Bulletins will be mailed promptly, without obligating you.

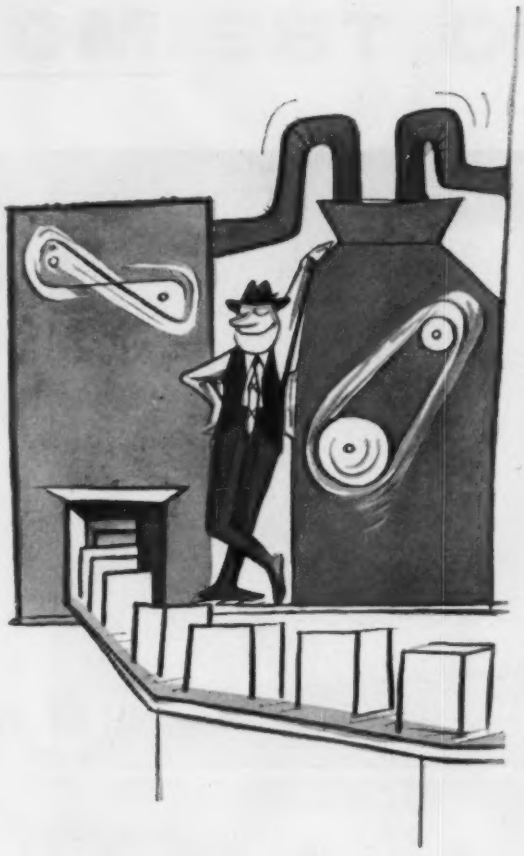
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

DISTRICT OFFICES:

Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries

For over a week, poor Mr. Bleak has been told, "Spare parts are coming!"



But RAILWAY EXPRESS delivered Peak's, and his production's humming!

The big difference is

RAILWAY EXPRESS AGENCY

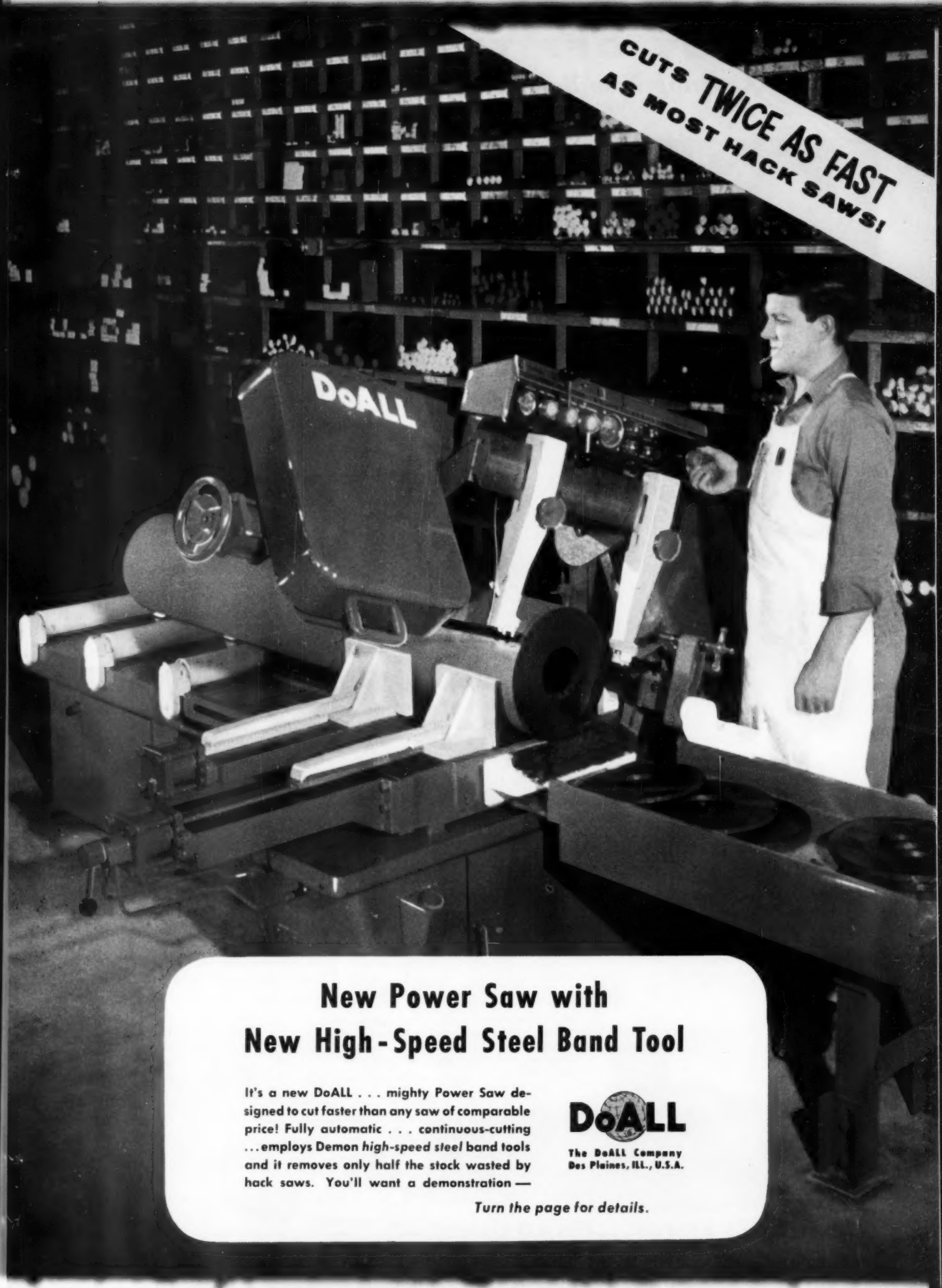
...safe, swift, sure

Whether you're sending or receiving... whether your shipment is big or small... whether it's by rail or air... for the best answer to your shipping problem, call Railway Express first—a complete shipping service in the American tradition of private enterprise.

As a contribution in the public interest, RAILWAY EXPRESS will take your orders for CARE.

CUT CUT-OFF TIME

DoALL Po...



New Power Saw with New High-Speed Steel Band Tool

It's a new DoALL . . . mighty Power Saw designed to cut faster than any saw of comparable price! Fully automatic . . . continuous-cutting . . . employs Demon *high-speed steel* band tools and it removes only half the stock wasted by hack saws. You'll want a demonstration —

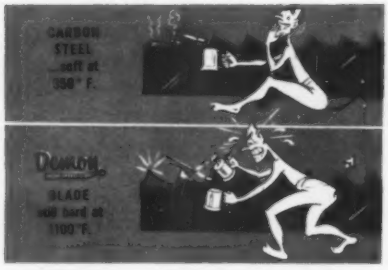
DoALL

The DoALL Company
Des Plaines, ILL., U.S.A.

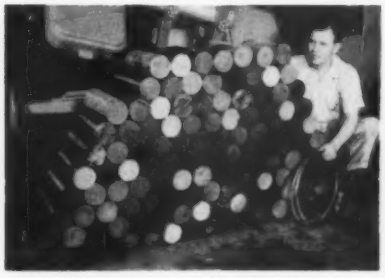
Turn the page for details.

CUT CUT-OFF TIME

with this Amazing New Bandsawing Team

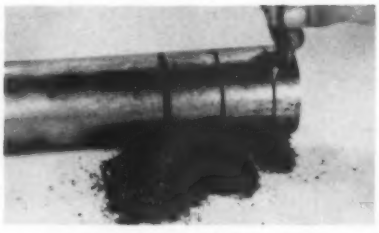


RED HEAT HARDNESS! Ability to take high temperature permits heavier feeds, high speeds.



LOWEST COST PER CUT! 300 pieces, 5" dia. CR steel cut with one Demon blade at a rate of 2 min. per cut.

LONGER BLADE LIFE! Ordinary blade lasted 10 cuts in hardened steel (42C), DEMON lasted 98.



LESS STOCK LOSS! Compare 1/16" Demon band kerf with 1/8" hack saw or 1/4" cold saw . . . less material reduced to chips.

Fully automatic feeding, indexing and sawing. Saw band tension and feed pressure automatically maintained for constant optimum results. Red heat hardness band tool. Capacity up to 12" rounds, 12" x 12" flats. Also fixed speed models without automatic indexing.

Faster Cutting Plus Longer Tool Life
Plus Less Stock Waste Means Lower Cost Per Cut

THE DoALL Power Saw is specifically designed to employ the new Demon *high-speed steel band tool.* This heat resistant tool can be run at higher speeds under heavier feed pressure than carbon steel blades. The Power Saw cuts at least twice as fast as any other type of cut-off machine of comparable power and capacity. Here are typical examples:

MATERIAL	SIZE	DoALL TIME
4340	7" dia.	7 min. 30 sec.
18-8 Stainless	3½" sq.	4 min.
1020	6" dia.	2.87 min.
Ketos	11¾" dia.	16 min.
1020	3½" dia.	1.3 min.
4150	9" dia.	10 min.

LESS STOCK WASTE. Compared with circular cutters, reciprocating hack saw blades or other parting tools, the DoALL saw band removes much less material. It produces a kerf only 1/16" wide. Savings in chip waste can be phenomenal.

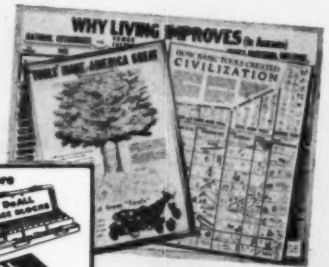
EXAMPLE. A DoALL Power Saw used to cut high chrome—high carbon slitter blanks saved one complete ½" piece every 8 cuts as compared with hack sawing. Each half-inch piece thus saved represented $30 worth of this costly material. And, the DoALL averaged 28 minutes per cut compared to 47 minutes for the hack saw.

FREE DEMONSTRATION. *You can see it and believe it! Call your local DoALL Store or write DoALL, Des Plaines, for a free demonstration. And, ask for new Catalog.*

Friendly DoALL Stores . . . (in 40 cities)

Personalized Service . . . Complete Stocks . . . Local Delivery

Call Your DoALL Service-Store
DoALL
SAW BANDS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
The DoALL Company, Des Plaines, Ill.



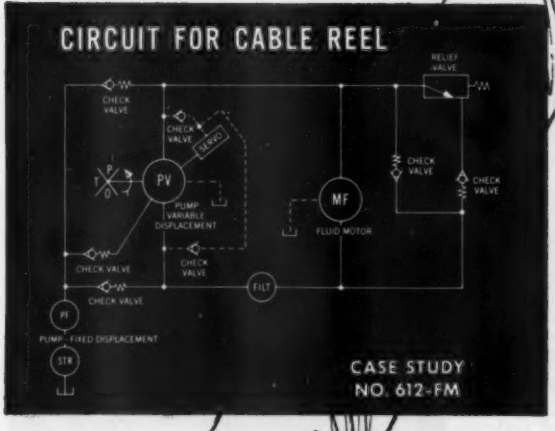
EDUCATIONAL STUDY WALL CHARTS

Economic Principles

$1.00 each Post Paid

Lower quantity prices.

Shock loads can't hurt this fluid motor



Denison Axial Piston Fluid Motors recommended for the toughest jobs . . . without qualification

● Quick starts, quick stops, stalling under load, continuous braking. These are the kind of conditions Denison Fluid Motors are built for. Where other motors fail, Denison hydraulic motors operate continuously . . . in conveying equipment, mining, drilling, construction machinery.

Through efficient axial piston design, Denison hydraulic motors pack high horsepower, high torque in a smaller space. The 400 series fluid motor is less than a foot long, weighs only 40 pounds . . . yet delivers 24 horsepower.

Denison Fluid Motors can be furnished to develop up to 180 horsepower, 5665 pounds-inches torque . . . for any hydraulic circuit to 5000 psi.

The circuit shows a Denison Fluid Motor that reels cable in and out of oil wells. For bulletins about Denison Fluid Motors, write to: THE DENISON ENGINEERING COMPANY, 1164 Dublin Road, Columbus 16, Ohio.

PUMPS • MOTORS
CONTROLS • PRESSES

DENISON
TRADE MARK
Hydr OIL ics

you can sharpen

4,800

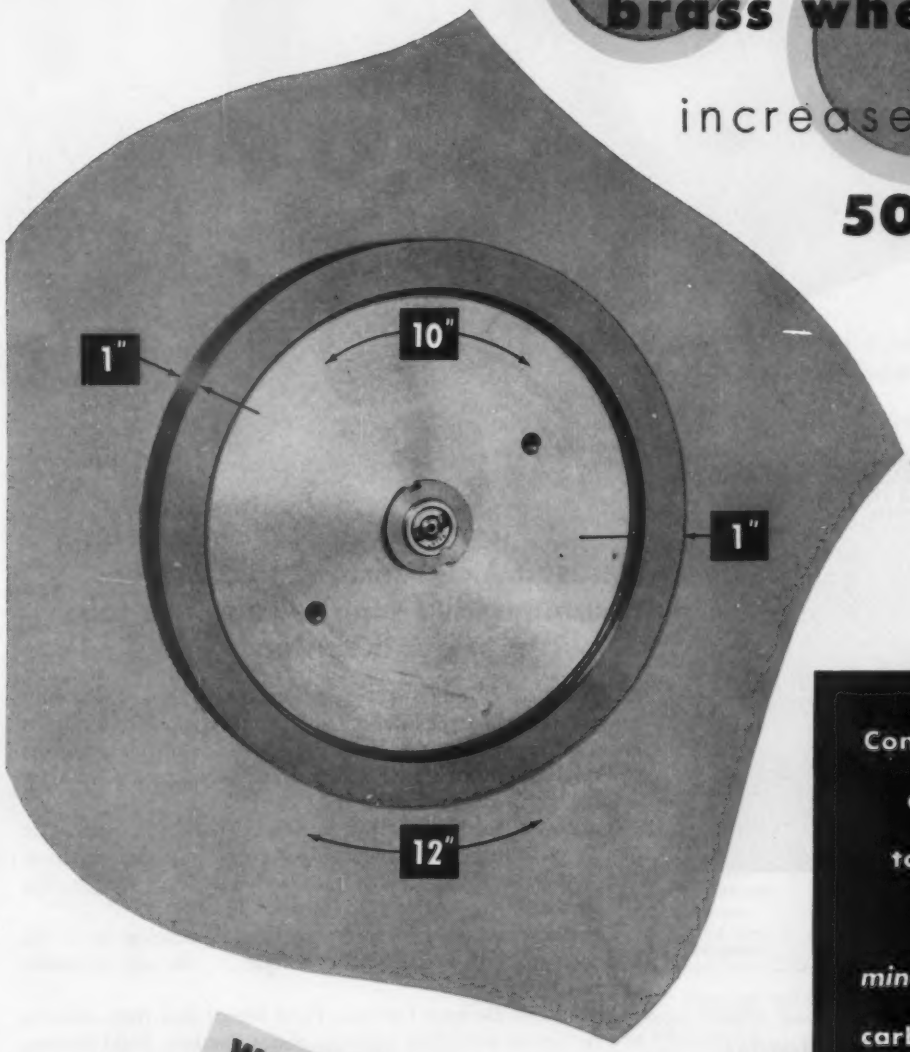
$\frac{1}{2} \times \frac{1}{2}$ tungsten carbide

insert tools with this $45

brass wheel and

increase tool life

50 to 200%



Ave. cost per tool sharpened:

.009¢

Convert from abrasive and diamond wheels to an Elox brass wheel and save 50 *minutes* sharpening 20 carbide insert tools.

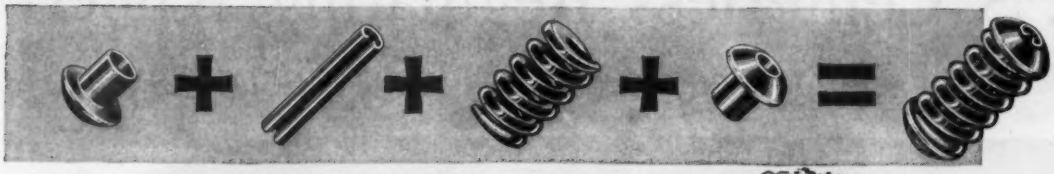
WE CAN SHOW YOU HOW!

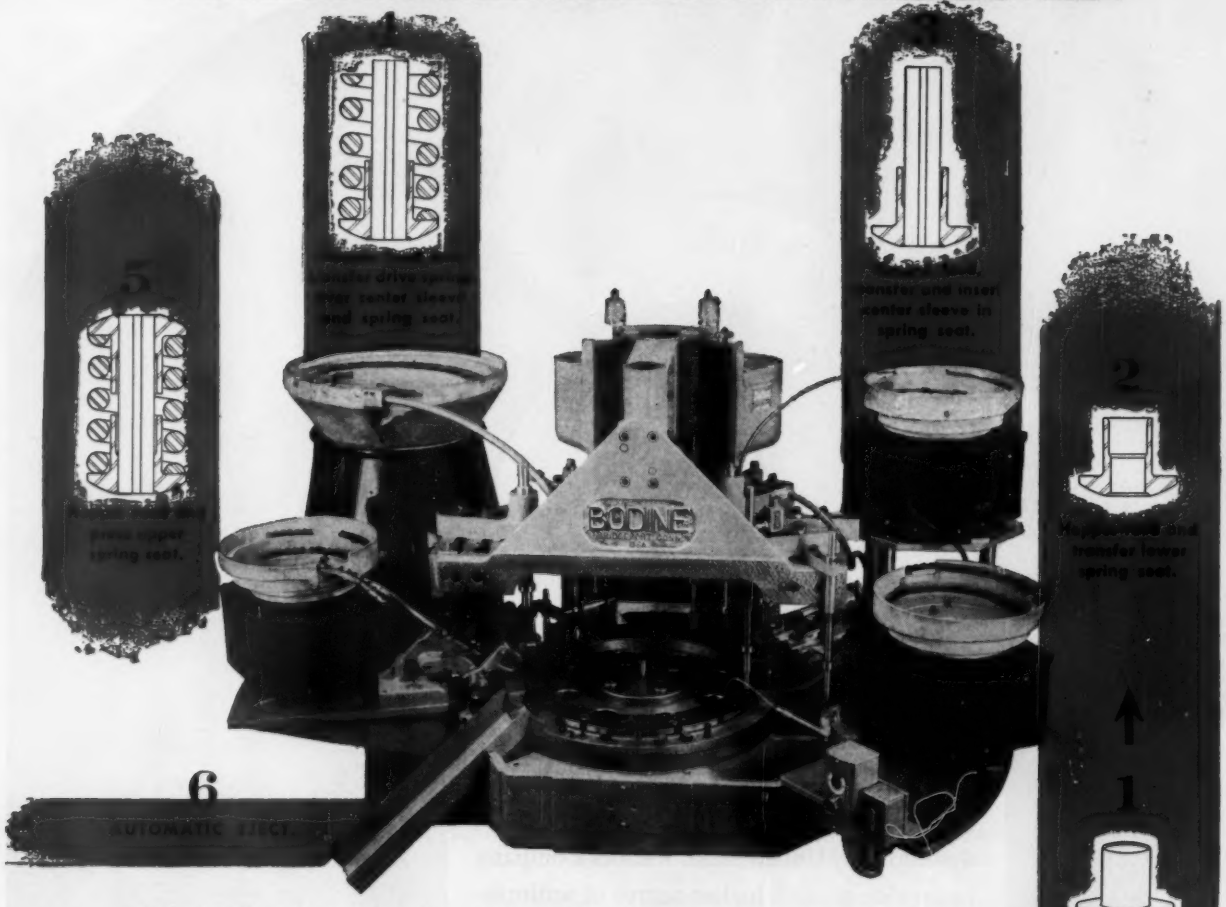
elox corporation of michigan

728 north rochester road • clawson, michigan

Bodine CASE HISTORY NO. 33

Bodine ASSEMBLES A DAMPENING SPRING *AUTOMATICALLY*





PRODUCTION: This high speed assembly job is automatically performed on a Bodine 42-30 dial type machine, equipped with four Syntron hopper feeds. It is specially tooled for assembly of a dampening spring for an automobile clutch plate.

All four components are hopper fed to position. Production is 40 assemblies per minute . . . automatically ejected.

Bodine engineers can solve your problems for repetitive production of small parts . . . milling, drilling, tapping or assembly, automatically . . . at low cost. Write Dept. AM-1.

You Can't Meet Tomorrow's Competition

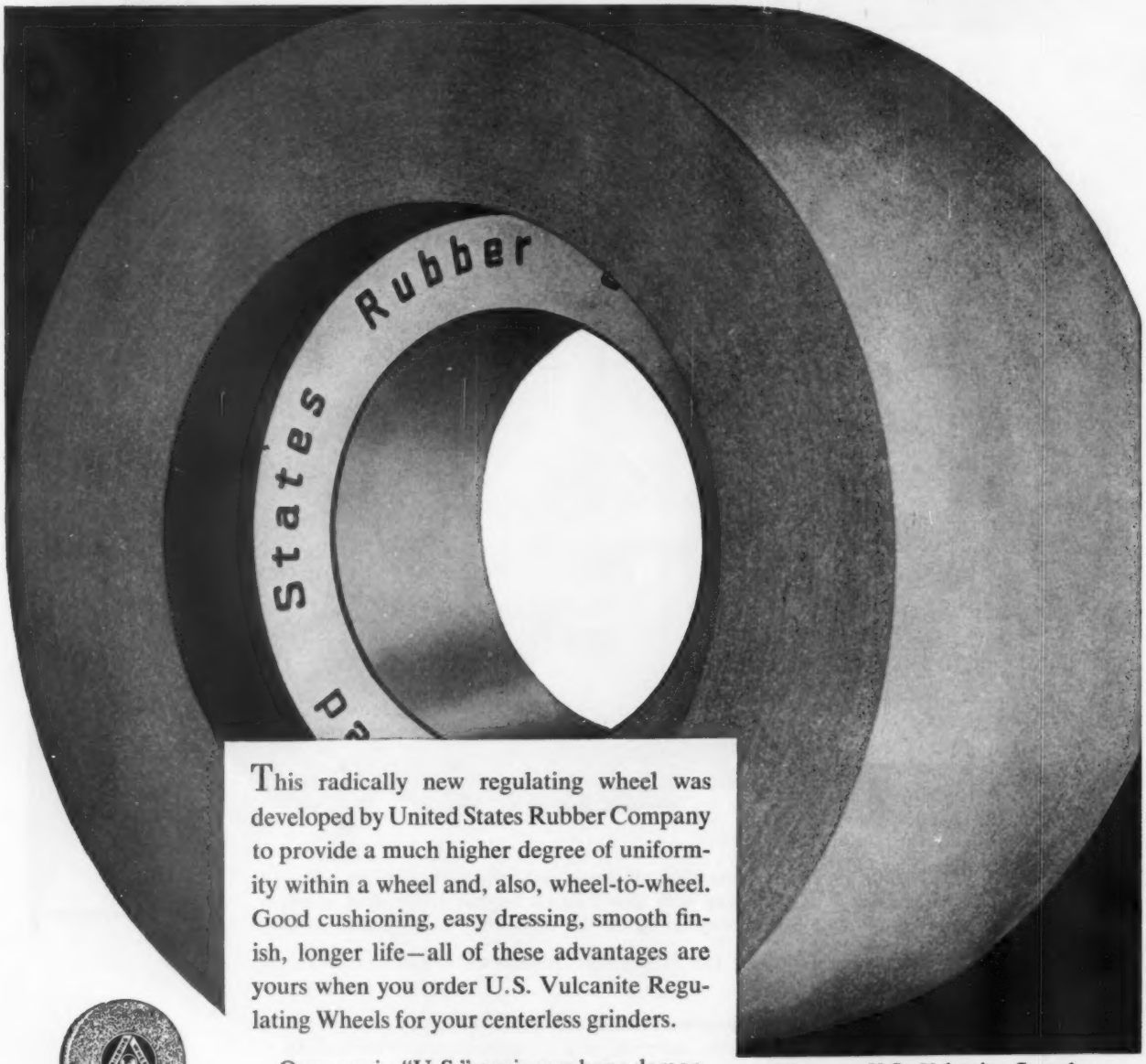
With Yesterday's Machine Tools

THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

SBD13

New!
U. S. Centerless Regulating Wheel
provides a degree of uniformity never before possible



This radically new regulating wheel was developed by United States Rubber Company to provide a much higher degree of uniformity within a wheel and, also, wheel-to-wheel. Good cushioning, easy dressing, smooth finish, longer life—all of these advantages are yours when you order U.S. Vulcanite Regulating Wheels for your centerless grinders.

Once again "U.S." engineers have demonstrated how they maintain the 91-year old "U.S." tradition of pioneering in bonds and abrasives. For service and information, write to address below.

The new U.S. Vulcanite Centerless Regulating Wheel requires less infeed, enabling the operator to hold size better.

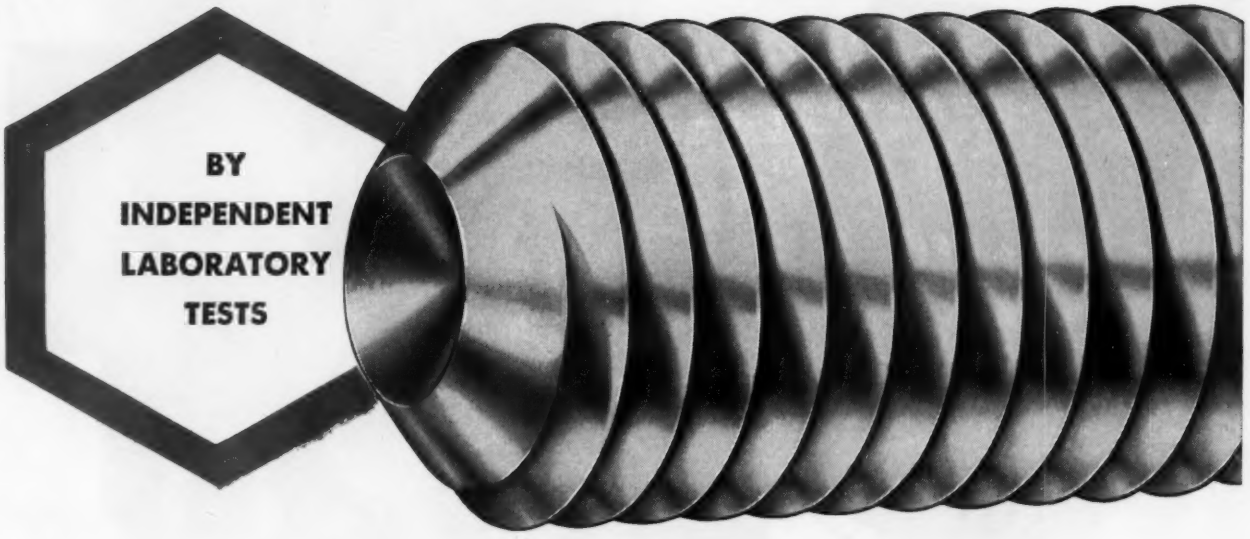
"U.S." Research perfects it
"U.S." Production builds it
U. S. Industry depends on it

US RUBBER

UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION · ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

ALLENPOINT SET SCREWS Proved 5 Ways Better



Tested by a prominent independent laboratory against standard cup point and serrated point set screws, Allenpoint socket screws topped them all. In every test — carefully set up to simulate actual installations — Allenpoints outperformed and outlasted competing set screws.

***BETTER* Cup Point Pattern**

Allenpoints make the all-important full circle pattern when tightened up to *ordinary* pressure — the normal force exerted to tighten a socket screw by hand.

***BETTER* Resistance to Rotation**

Deep driven Allenpoints hold longer under increasing torsional strain than any other set screw tested.

***BETTER* Cup Point Depth**

The deeper they drive the tighter they hold. Allenpoints — again at average wrenching pressure — penetrate smoothly and deeply with no gouging, no cutting action.

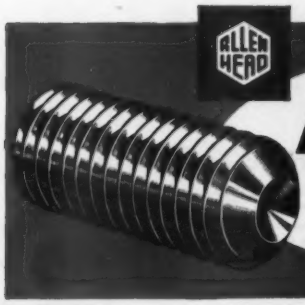
***BETTER* Resistance to Longitudinal Thrust**

Tighten an Allenpoint held collar to a shaft with a wrenching pressure of only 150 inch pounds. It will take 1200 lbs. of longitudinal thrust to start that collar along the shaft. No pipe extension, no twisted wrenches to get effective tightening pressure. Allenpoints hold tightly at average *hand wrenching* pressure.

***BETTER* at Withstanding Vibration**

Long after other set screws loosen their grip, Allenpoints hold firm under repeated vibration.

Write our Advertising Department for a detailed, technical brochure on these comparative tests. It's got the facts on the Allenpoint story.



ALLEN HEAD

ALLEN

MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.

Sold Only Through Leading Industrial Distributors.

Specify Genuine Allenpoint Set Screws.

An Outstanding Advance

in PLUNGE FORM GRINDING

Sets New Records for Production and Accuracy . . . Reduces Costs . . . Replaces Other Methods for Producing a Great Variety of Work! Note These Advanced, In-Built Features!

- **Completely automatic cycle** — High speed approach, wheel feed spark out and withdrawal are positively controlled through simple cam action — ensuring constant, uniform operation under all conditions.
- **Automatic positive size control** — The wheel slide is held against positive stops with uniform hydraulic pressure.
- **Automatic trueing device** with controlled dressing.
- **Automatic or manual handling.**
- **Complete versatility** — chucking work, center work or shoe-type grinding; crush wheel or diamond trueing.
- **Compact design** — affords exceptional accessibility and simple set-ups.

P.S.

Write for illustrated folder — gives complete specifications and examples of how the Model "E" does jobs faster, better and more economically.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L MACHINE TOOL DIV.

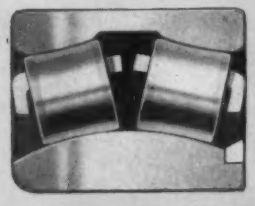
NEW! For severe impact and heavy loads LINK-BELT presents "MILL BEARINGS"

Link-Belt "Mill Bearings" are part of industry's most complete line of ball and roller bearing blocks.

STEEL PILLOW BLOCKS are the answer wherever bearings must withstand great shock and impact loads—as on steel mill, foundry, oil drilling, mining, construction and other heavy-duty equipment. That's why Link-Belt offers this line of Mill Bearings.

Perhaps your bearing demands are less extreme. Whatever your need, you'll find the right answer in this complete line of pillow blocks . . . plus flange, flange-cartridge, cartridge, take-up and hanger blocks and self-aligning roller bearings. Ask your nearest Link-Belt office or authorized stock-carrying distributor for a copy of the helpful 120-page Data Book 2550 on the full line, and 8-page Book 2565-A on Link-Belt "Mill Bearings."

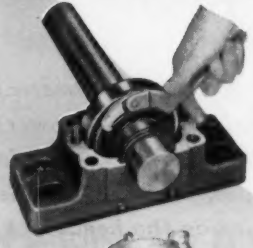
All these important differences are found only in Link-Belt "MILL BEARINGS"



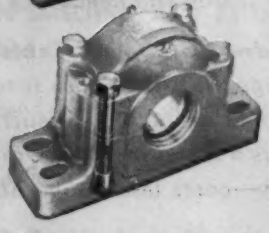
FREE-ROLLING SELF-ALIGNMENT. Adjusts immediately in all directions, assuring full load capacity, even when subjected to shaft deflections and inaccuracies of mounting. Important because "Mill Bearings" are subject to heavy, sudden shock loads.

ONE BASIC HOUSING accommodates either type of seal shown at left. They keep lubricant in and dirt out.

Left, Spiral Labyrinth Steel Seals for heat conditions, oil or grease lubrication. Right, "Tri-Flex" Seals for dusty conditions, grease lubrication.



EASY INSTALLATION AND MAINTENANCE. Removal of cap means removal of bolts and hence no interference with assembly and inspection.



SUPER-RUGGED STEEL HOUSING. Four large heat-treated thru-bolts lock with heat-treated alloy steel serrated nuts to firmly clamp cap and base, permitting maximum radial and thrust loads. Big base area supports the bearing and withstands the extremely heavy pounding of mill and other grueling operations.

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,710-A

LINK-BELT

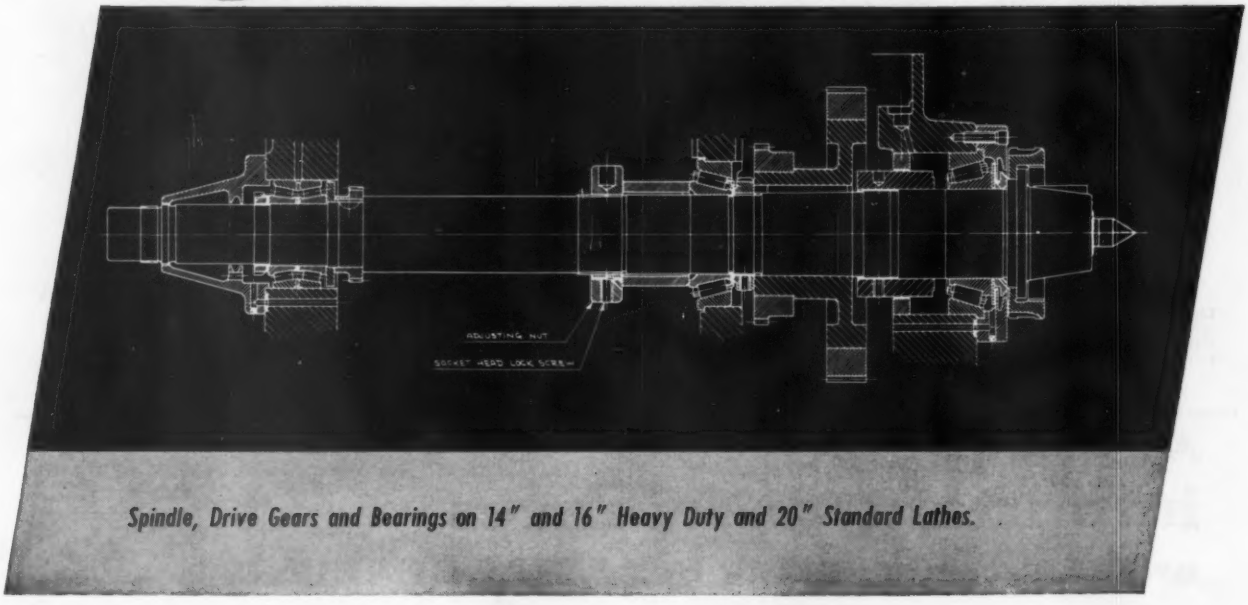
Ball and Roller Bearings

FOR A BETTER DRIVE

...Lodge & Shipley puts it

"ON THE NOSE"

... Locating drive gears and main bearings near spindle nose, drive gears rigidly keyed to spindle for maximum strength — power — accuracy.

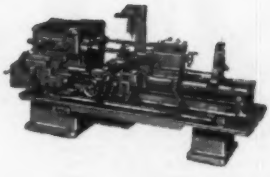


Spindle, Drive Gears and Bearings on 14" and 16" Heavy Duty and 20" Standard Lathes.

Location of driving force and bearings close to the load is a proven advantage in power transmission. Lodge & Shipley drive gears and main bearings are literally "on the nose," grouped at the forward end of the spindle just inside the headstock.

Giving extra ruggedness and power, this detail is an example of the design skill that goes into every part of the Lodge & Shipley Lathe. The result, proved by thousands of users, is a lathe that gives more in production and accuracy—costs less in operation.

For your next lathe, consider a Lodge & Shipley. A representative will welcome the chance to compare a Lodge & Shipley . . . point by point . . . with any other lathe. Request Bulletin No. 200 which describes and explains the many features. The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.



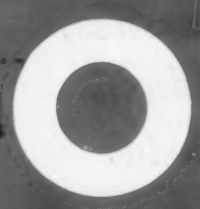
Lodge & Shipley

....your **LODGE-ical** *choice!*

Cents per lb. for Bearing Bronzes Isn't the Whole Story...

IF YOU BUY A ROUGH-CAST BAR . . .

to make this



1" I.D. x 2" O.D.
Weight: 9.0 lbs./ft.

you get this

¾" I.D. x 2¼" O.D.
Weight: 13.5 lbs./ft.

note the scrap loss

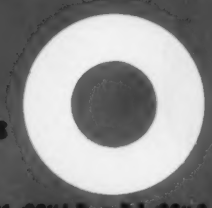
4.5 lbs./ft. lost!

BUT IF YOU BUY ASARCON 773 . . .

to make this

1" I.D. x 2" O.D.
Weight: 9.0 lbs./ft.

you get this



31/32" I.D. x 2-1/32" O.D.
Weight: 9.7 lbs./ft.

almost no scrap!

Only 0.7 lbs./ft. lost!

Thus far only the SIZE (diameter) of the bronze has been considered. ALSO, with Asarcon 773 you are able to buy exactly the length you need, short or up to 105" long. You get no costly short-ends! More dollars saved . . . no remnants!

In addition, Asarcon 773 (SAE 660) stock bronze has no blow-holes, no pits and no shrinks. The patented continuous casting process by which it is made uses no sand; there are no inclusions in the metal to damage tools. Properties are far superior to those of the similar sand-cast or permanent mold-cast alloys.

Asarcon 773 is available in 216 sizes — tubes and solids — from the stocks of distributors in principal cities. Continuous-Cast Bronze is also made to order in a wide variety of other alloys, in rounds and other shapes . . . up to 20' in length.
Use coupon below for NEW bulletin giving details.

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AMERICAN SMELTING AND REFINING COMPANY
Perth Amboy Plant, Barber, New Jersey

- ☐ Please send new brochure on Asarcon 773 stock bearing bronze
- ☐ Send literature on other Continuous-Cast Bronzes
- ☐ Send a salesman

Name_____ Title_____

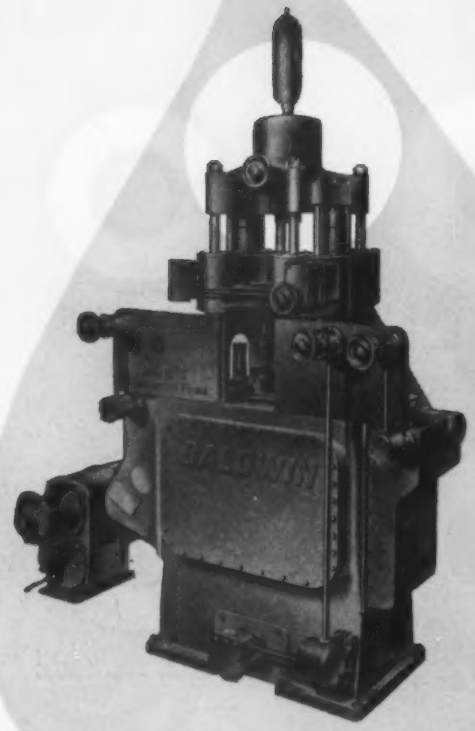
Company_____

Address_____

City_____ Zone____ State_____

HYDRAULIC HEAD

avoids overloading, controls densities, in new Baldwin powdered metal presses . . .



YOU'LL GET a whale of a lot more by specifying a Baldwin Model "L" or Model "C" for your next powdered metal press. Why? Because these new Baldwin presses are the very first designed specifically for compacting powdered metals.

Here's just one of the reasons why it'll pay you to standardize on Baldwin to take care of your pressing needs . . .

Both the 50 ton ("L") and 100 ton ("C") presses feature a hydraulic head which supplies opposing pressure for the upper punch. It works like this: if the compressing pressure exceeds the setting of the hydraulic accumulator, the upper punch "gives" to the limit of the setting . . . that enables the hydraulic head to benefit you in three very vital ways:

1. It prevents overloading of the press, thus prolonging the life of both tools and press.
2. It makes it possible to compact powdered metal parts to more uniform densities.
3. It permits use of more delicate tools.

For copies of new bulletins with full technical information on Models "L" and "C" please write to our Department 4502, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pennsylvania.

BALDWIN BLH LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities

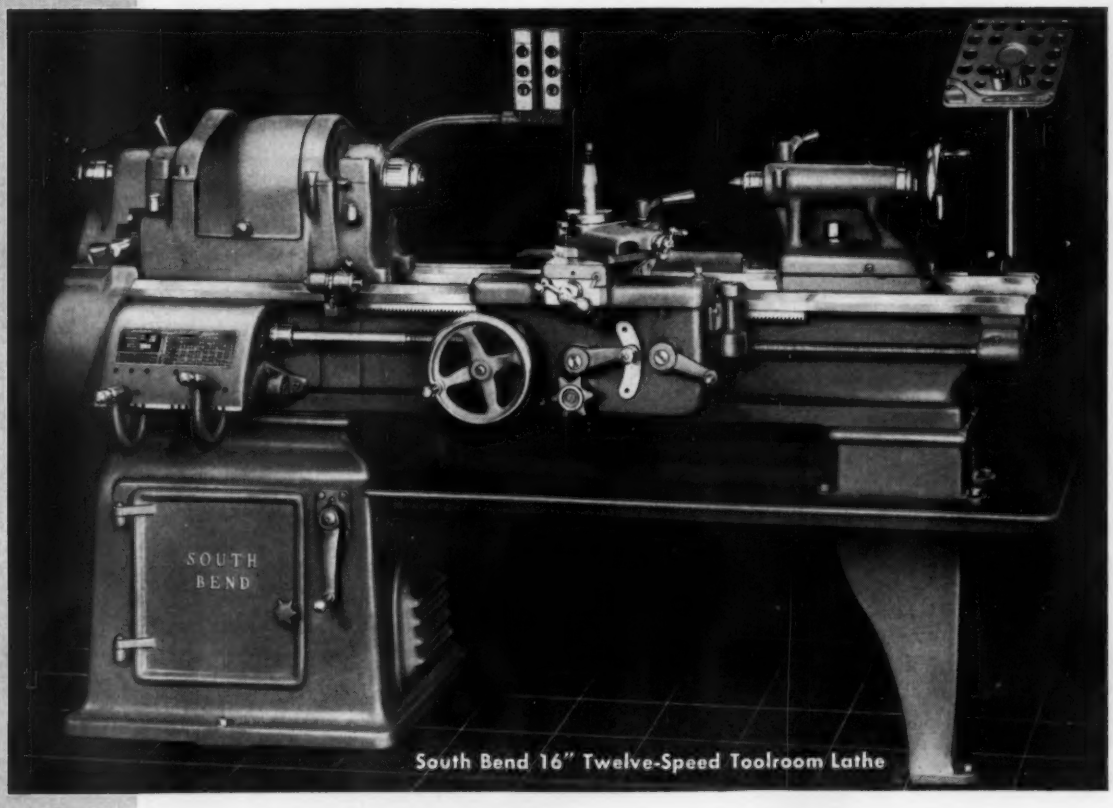
Cuts Machining Time

The wide range of spindle speeds on this new lathe cuts machining time because the operator quickly selects the right speed for each operation. Pushbutton control provides a fast change from any high speed to the corresponding low speed. This versatility is further increased by 48 choices of longitudinal and cross feeds which insure maximum efficiency on every job. Also, you will

SOUTH BEND 12 SPEED LATHE

find that its accuracy and ease of operation makes your tough job easy. Send the coupon for complete information.

CL5155C, 6′ bed, below, f.o.b. factory less electrical equipment. Low down payment, up to 24 equal monthly payments. Only 3¼% interest on original unpaid balance. **$2690.00**



South Bend 16" Twelve-Speed Toolroom Lathe

SPECIFICATIONS

Spindle Speeds — 12. Direct drive: high range 300, 550, 945; low range 150, 278, 475. Back gear drive: high range 32, 70, 118; low range 20, 33, 60.

Spindle Bore — 1⅜".

Swing over bed and saddle wings — 16¼".

Swing over saddle cross slide — 9⅜".

Distance between centers — 33¼", 45¼", 57¼", 81¼", 105¼".

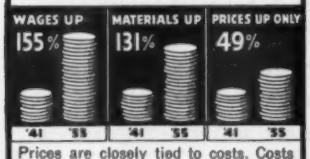
Collet Capacity — 1" maximum.

Longitudinal Feeds — 48 R.H. or L.H., .0015" to .0841".

Cross Feeds — 48, .0006" to .0315".

Thread Pitches — 48, 4 to 224 per inch.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941



Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

PLEASE SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ ½" & 1" Collet TURRET LATHES ☐ TOOL GRINDERS ☐ 7" BENCH SHAPERS

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Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

Seven years service for STANOIL Industrial Oil at David Bradley Mfg. Works —No down time for lubrication

L. R. Cummings (left), Standard lubrication specialist, inspects sample of STANOIL, with Robert C. Menken, Plant Engineer of David Bradley Manufacturing Works. Larry Cummings has been serving industrial customers for Standard Oil since graduation from Standard's Sales Engineering School. His mechanical engineering degree from Tri-State College of Indiana qualified him for this work. Customers of Larry's find this experience and background pay off for them.

David Bradley Tri-Trac, handy piece of farm equipment, gives farmer new opportunity for mechanization at low cost. Upper frame on which gasoline tank is mounted, is part formed in HPM press.

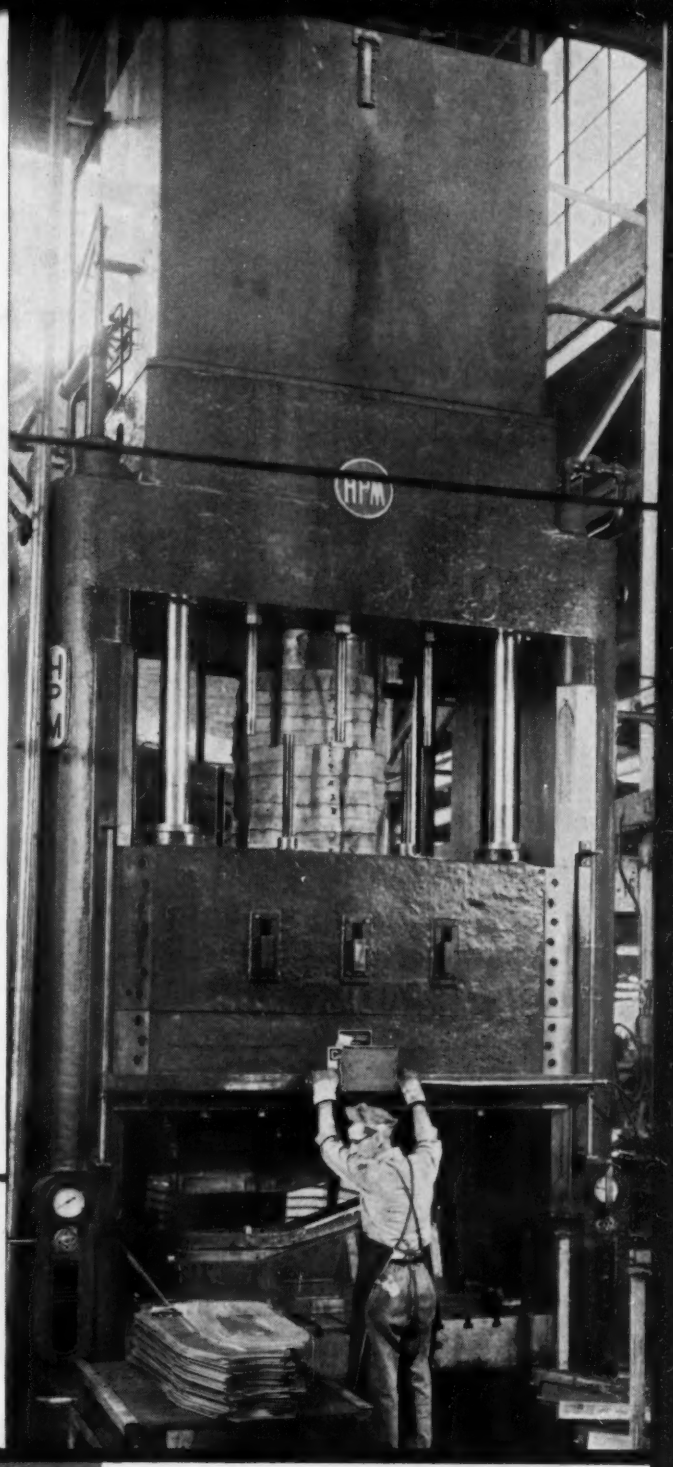
Seven years ago, David Bradley Mfg. Works installed 900 gallons of STANOIL Industrial Oil in an HPM press. There's been no down time required for lubrication maintenance since. A pump by-pass screen filter is the only filtering the oil receives, yet the system continues clean. In March, 1954, an analysis of the oil showed:

Viscosity @ 100°F.—980
Color, NPA — 6
Neutralization No.— .11

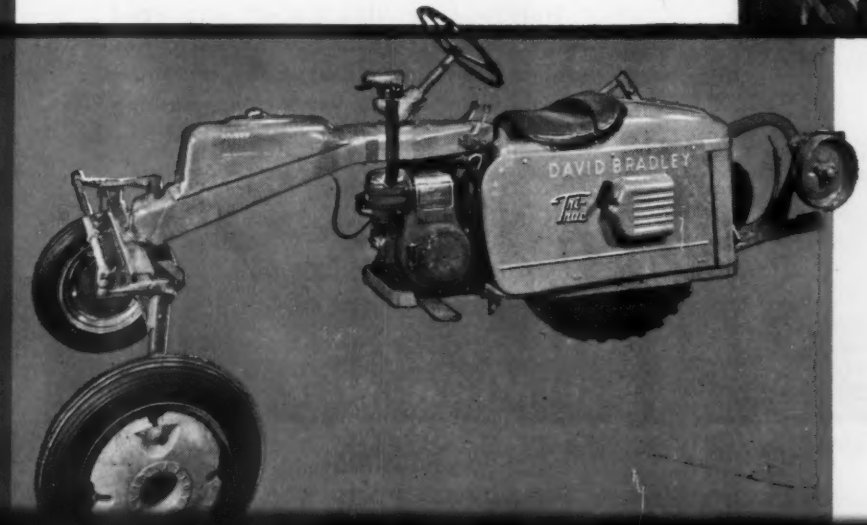
STANOIL Industrial Oil has long been at work for Bradley. Successful operations with it in other equipment caused Bradley engineers to specify STANOIL for this installation.

The HPM double acting, fast traverse hydraulic press reported on here is used to draw the upper frames for the David Bradley Tri-Trac, compact farm tractor. The Tri-Trac is the newest implement in the Bradley line. Bradley has been making farm implements since 1832.

Like to know more about STANOIL? Perhaps it can serve you as efficiently as it is serving David Bradley. Lubrication specialists in any Standard Oil office will be happy to help. In the midwest, a call to one of them will bring a prompt response. Or contact: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



HPM 500-ton press on the upstroke after drawing upper frame for David Bradley Tri-Trac. Hydraulic system remains clean after 7 years service using STANOIL.



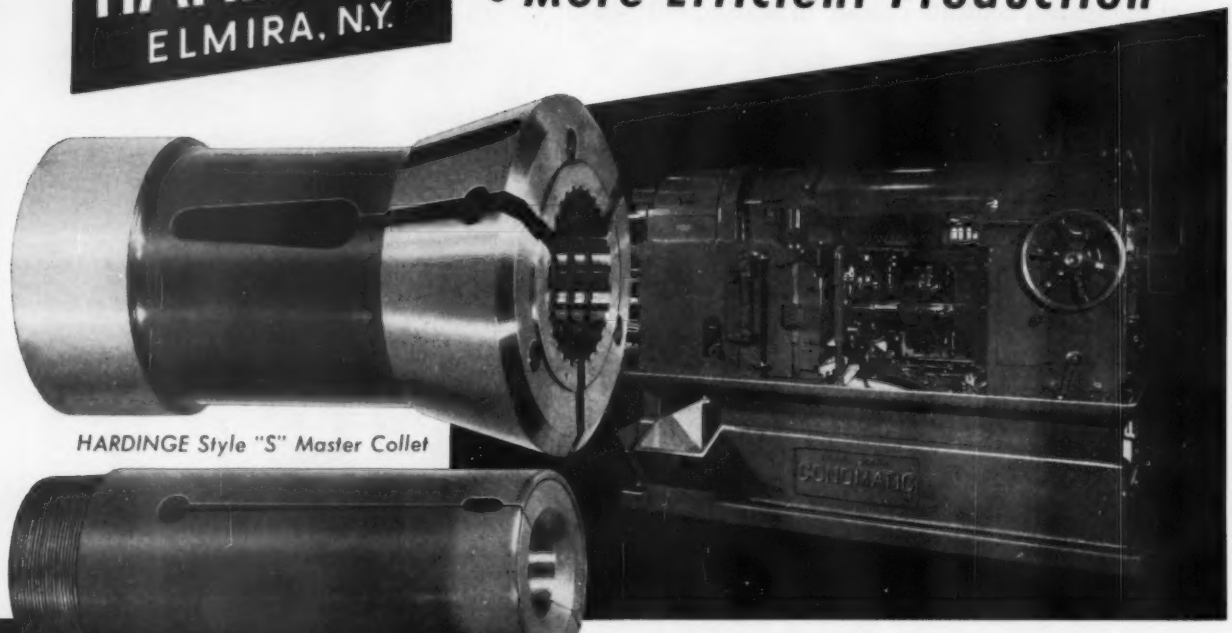
STANDARD

STANDARD OIL COMPANY
(Indiana)

HARDINGE COLLETS and FEED FINGERS for Cone Automatics*

HARDINGE
ELMIRA, N.Y.

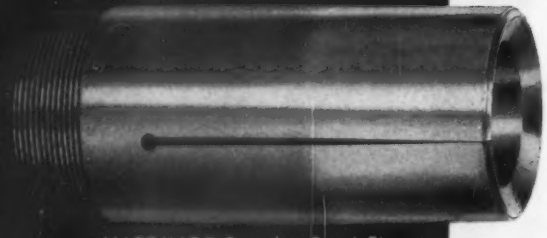
- *Low Tooling Cost*
- *More Efficient Production*



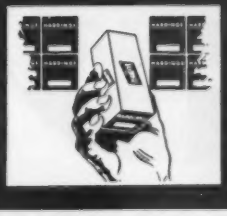
HARDINGE Style "S" Master Collet

HARDINGE Style "B" Master Feed Finger

HARDINGE Regular Collet



HARDINGE Regular Feed Finger



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Maximum production at lowest cost is assured when you specify HARDINGE Collets and Feed Fingers

Hardinge Master Collets and Master Feed Fingers feature low-cost replaceable pads that are interchangeable among different makes of automatics with the same capacity.

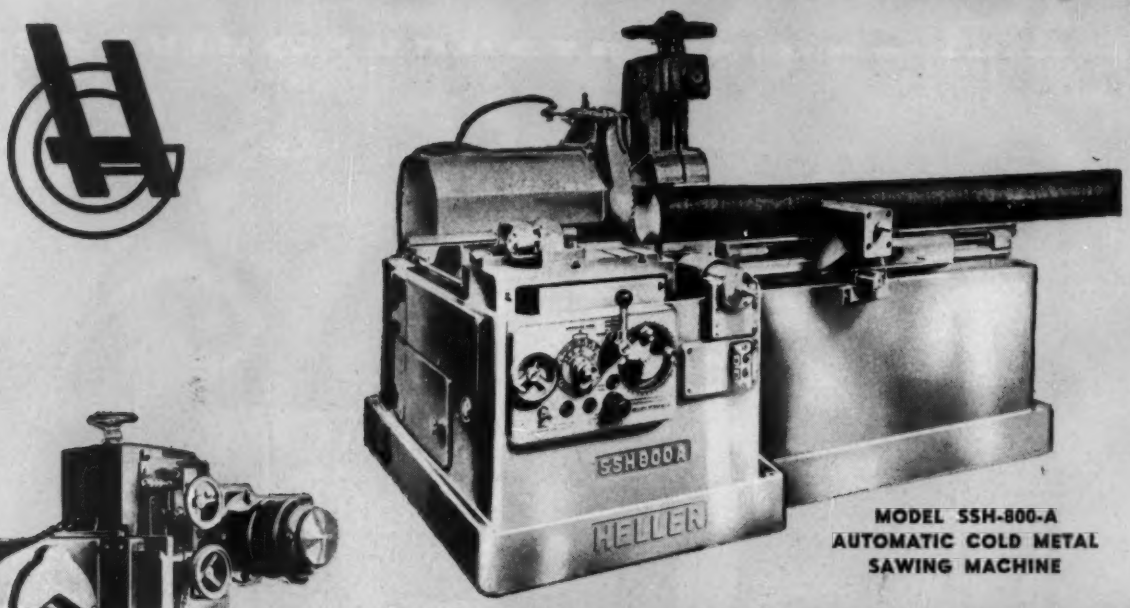
Hardinge Masters give true solid collet and feed finger performance.

Hardinge Regular Collets and Feed Fingers are precision made, hardened and ground internally and externally, and bring you the benefit of 62 years of engineering and manufacturing experience.

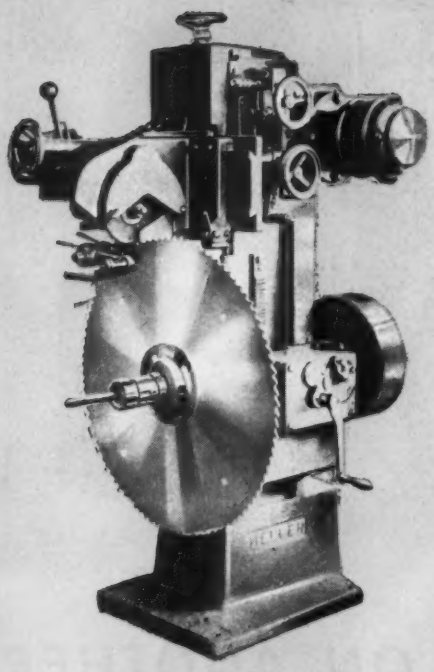
* *Also available for the following automatics: Greenlee, Gridley and Acme-Gridley, National Acme, New Britain*

Hardinge is your one source of supply for all collets and feed fingers.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.



MODEL SSH-800-A
AUTOMATIC COLD METAL
SAWING MACHINE

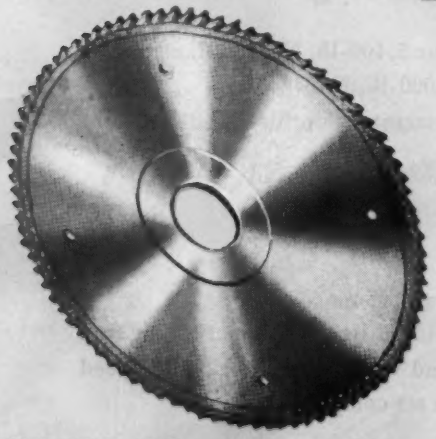


MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

Cutting Costs and
Increasing Efficiency with

HELLER

COLD SAWING MACHINES
BLADE SHARPENING MACHINES
AND SAW BLADES



HELLER GIVES YOU COMPLETE SERVICE WITH
EXACTLY CORRECT BLADES.

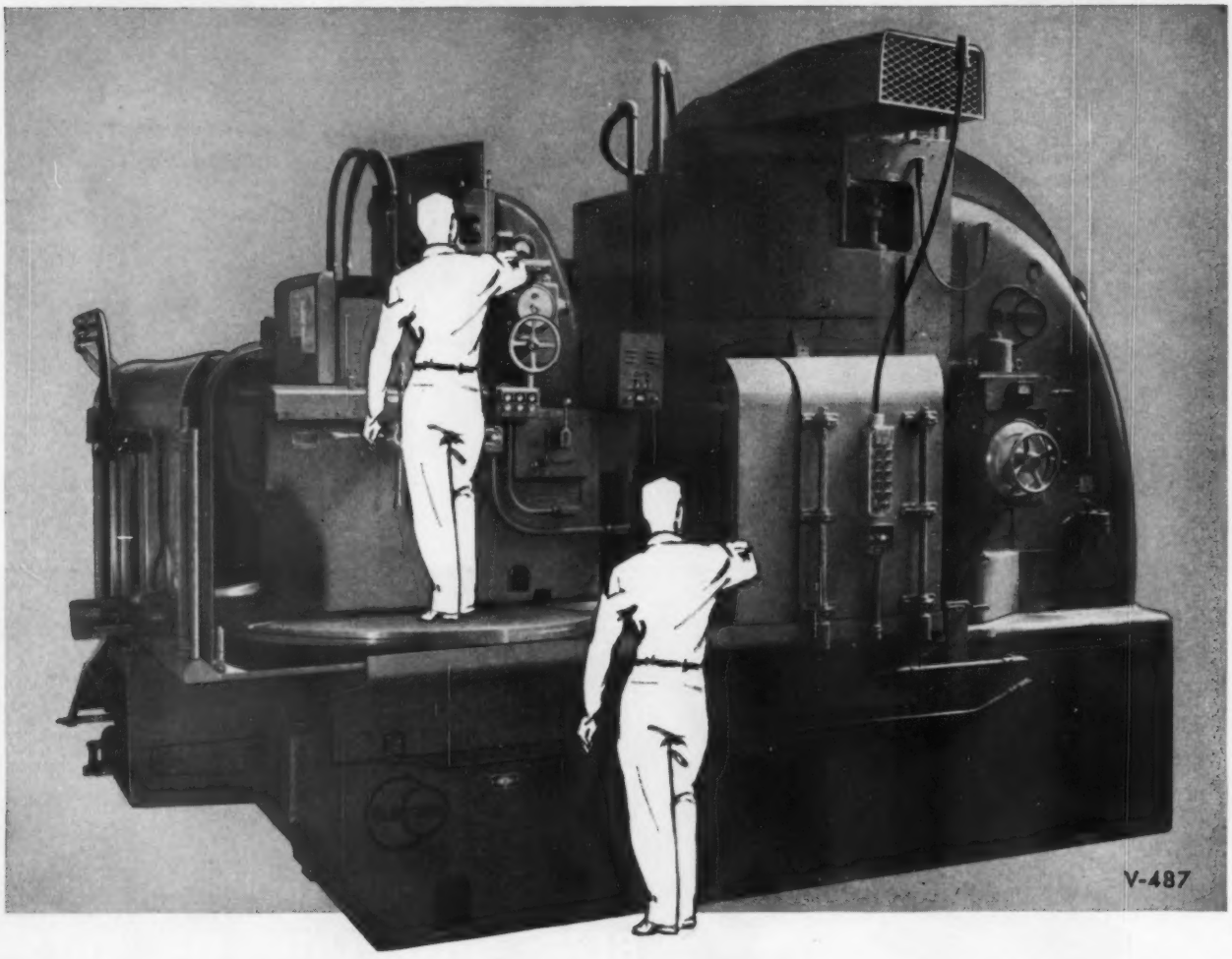
Heller High Efficiency Cold Metal Sawing Machines are built in both manual and fully automatic types in machine sizes ranging from 3" bar capacity up to 48" billet capacity and blade sizes from 12" to 120" diameter. They are full hydraulic with completely centralized operating control. Illustration shows our SSH-800-A full automatic with bar capacity to 10" round stock.

The Model B-650 machine shown represents a new construction in arrangement and operating features. Using change gears and built-in dividing head, it insures a true tooth pitch and form and eliminates the use of a variety of master index plates for varying diameters and pitches of saw blades. Machine is rigidly constructed to secure extremely high grinding capacity and performance and produces a true and correct cutting tooth shape. Machines built in five sizes for 2½" to 120" diameter saw blades.

Importing Heller Machines Since 1926

HELLER MACHINE COMPANY, 114 Liberty St., New York 6, N. Y.

KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES



WE PUT ONE BLANCHARD ON ANOTHER

. . . to show you the wide range of sizes!

It's true! There's no "trick" photography involved. Our 5,400-lb. No. 11 Blanchard Surface Grinder fits snugly on the 84" chuck of our giant 61,000-lb. No. 42-84. And, like all Blanchards, both have chucks flat within .0002" – guaranteed!

Do every surface grinding job in your shop *perfectly* . . . whether you grind tiny watch parts – steel plates 7 feet across corners – or anything in between . . . *put it on a Blanchard.*

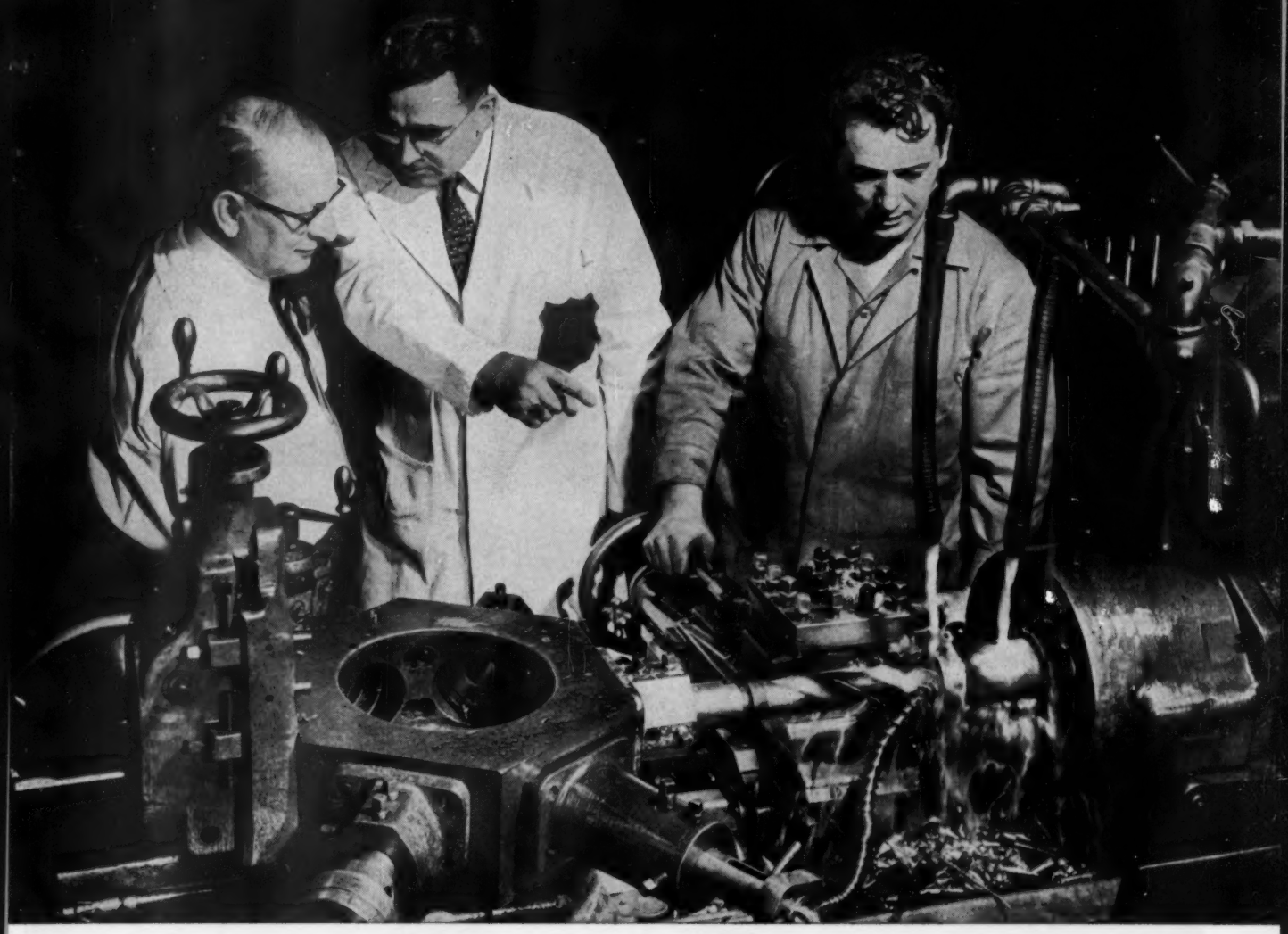
Whatever your requirements for stock removal, tolerances or surface finish, ask for details on the 15 standard Blanchard models today. One of them will fill your needs perfectly and will do your work with speed and precision – at costs which help you set competitive prices.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

SERVING INDUSTRY SINCE 1881



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● The Standard Tool Man, Serving Industry Since 1881, can recommend changes in drill grinds, speeds and feeds that will enable you to make substantial savings in your plant.

The Standard Tool Man is a specialist in cutting metal and cutting costs. His service is backed by Standard's modern research laboratory. He is at your service without obligation.

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STANDARD TOOL CO.

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THE STANDARD LINE *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

You can spot productive hands by the
Behr-Manning abrasives
boost production
all along the line...

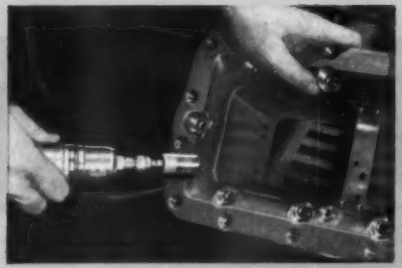
company they keep...

Cleaning-up the tough little jobs with Behr-Manning special abrasive tools

With METALITE Abrasive Specialties on hand, it's a cinch to produce fast, easy finishes on hard-to-get-at surfaces. These Specialties, teamed with today's high-speed power tools, answer industry's demand for a faster rate of production. They're available in a wide range of sizes, shapes and grits. Try them on your problem jobs.

Write for the Production Digest Bulletin. Contains detailed data on coated abrasives grinding and polishing techniques. Address Behr-Manning, Troy, N. Y., Dept. AM-1

In Canada. Behr-Manning (Canada) Ltd., Brantford.
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.



Metalite Cloth abrasive pencils make easy work of deburring or radiusing.

Flexible Metalite Spiracords save time in deburring inside radii.

Moulded Metalite Mushroom Discs and convex rubber pad remove tool marks rapidly.

G-1

BEHR-MANNING®

BEHR-MANNING
division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

Now...A Completely NEW Line

Again DELTA sets the pace with the finest line of 14" Drill Presses ever offered . . . at no increase in price!

NEW IN PRECISION PERFORMANCE

You've never seen a 14" drill press perform like these new Rockwell-built Delta machines. Tolerances down to .002" are *easy* with the new, positive, self-locking depth stop that you set with one hand. *All* the adjustments, all of the controls, are designed for greater accuracy with greater ease and speed than you've ever known. Yet the new Delta 14" Drill Press is *rugged*, built to *stay* accurate under the toughest production-line abuse.

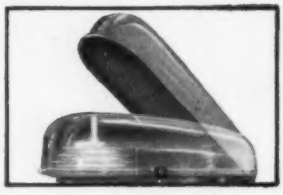
NEW IN COST-CUTTING VERSATILITY

Use the new 14" Delta to drill, counterbore, tap, rout, mortise, shape—and for dozens of other general and specialized jobs. Use it on metal, wood, plastics. Use it to supplement—or replace—more expensive single-purpose equipment throughout your shop. There is practically no limit to the ways in which the versatile new Delta 14" can turn out precision work for you—faster, with less operator fatigue, and at lower cost!

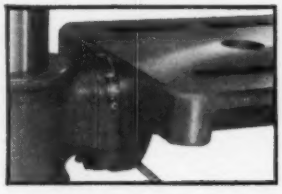
NEW IN EVERYTHING BUT PRICE!

The new 1955 DELTA 14" Drill Press gives you many new features, but it costs no more than previous models. Only Delta—long the drill press leader—has both the manufacturing know-how and the sales volume to give you *more* for your money. So don't put off seeing the new Delta 14" floor models, bench models, single and multiple spindle models. They're all *new*, all *better* than ever, and your Delta Dealer has them *at no increase in price!*

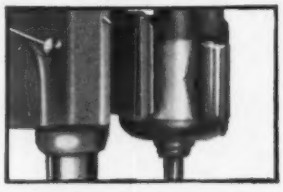
NEW IN ALL THESE WAYS . . .



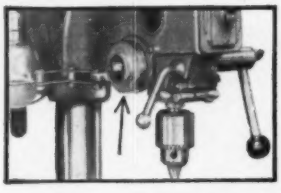
New counter-balanced belt guard stays up out of way when changing speeds.



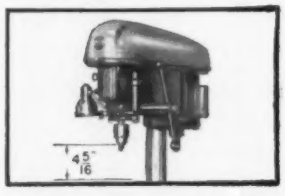
New tilting table with positive stops and calibrated scale for quick positioning.



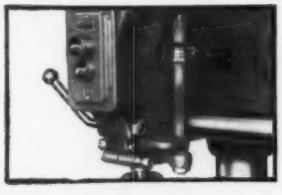
New pivoting motor mounting plate, speeds changes, lengthens belt life.



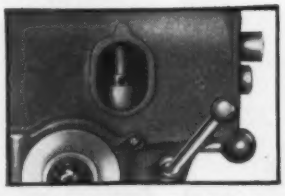
New quick-set depth gage for faster, more accurate depth-of-penetration readings.



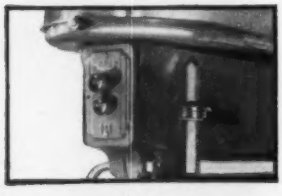
New greater-capacity quill design allows full 4 5/16" spindle travel.



New self-locking depth stop with micrometer sleeve calibrated to .002".



Spindle is fully enclosed with new side opening for easy changeover.



New control design puts accessory push-button starter up front for quick, safe control.

DELTA ROCKWELL

DELTA QUALITY
COSTS NO MORE

DELTA QUALITY POWER TOOLS

Another Product by **ROCKWELL**

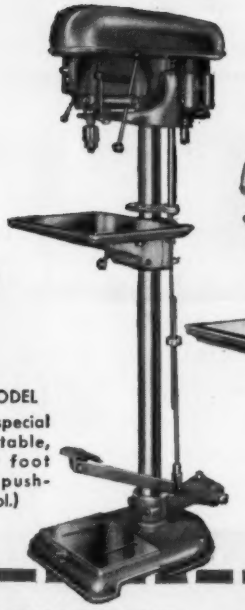
# of DELTA 14" Drill Presses!

BENCH MODEL

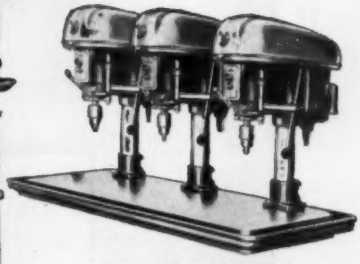
SEE THEM NOW!

A ten-minute demonstration will tell you more than ten thousand words about the great new DELTA 14" Drill Press line! See for yourself how they give you so much that's new and better without losing any of the best time tested Delta features. See how the *low* Delta price gives you the biggest drill press value in history!

Let your Delta Dealer demonstrate the great new line of Delta 14" Drill Presses *now!* He's listed in the classified pages of your phone book under "TOOLS" or "MACHINERY."



FLOOR MODEL
(shown with special production table, accessory foot feed and push-button control.)



MULTIPLE SPINDLE MODEL
(from 2 to 200 heads!)

BE SURE TO SEND
THIS COUPON FOR FULL CATALOG DATA

Delta Power Tool Division, Rockwell Manufacturing Company
618A North Lexington Avenue, Pittsburgh 8, Pa.

☐ Please send catalog on new Delta 14" Drill Press line.

☐ Please send name of my nearest Delta Dealer who has the new 14" Drill Press on display.

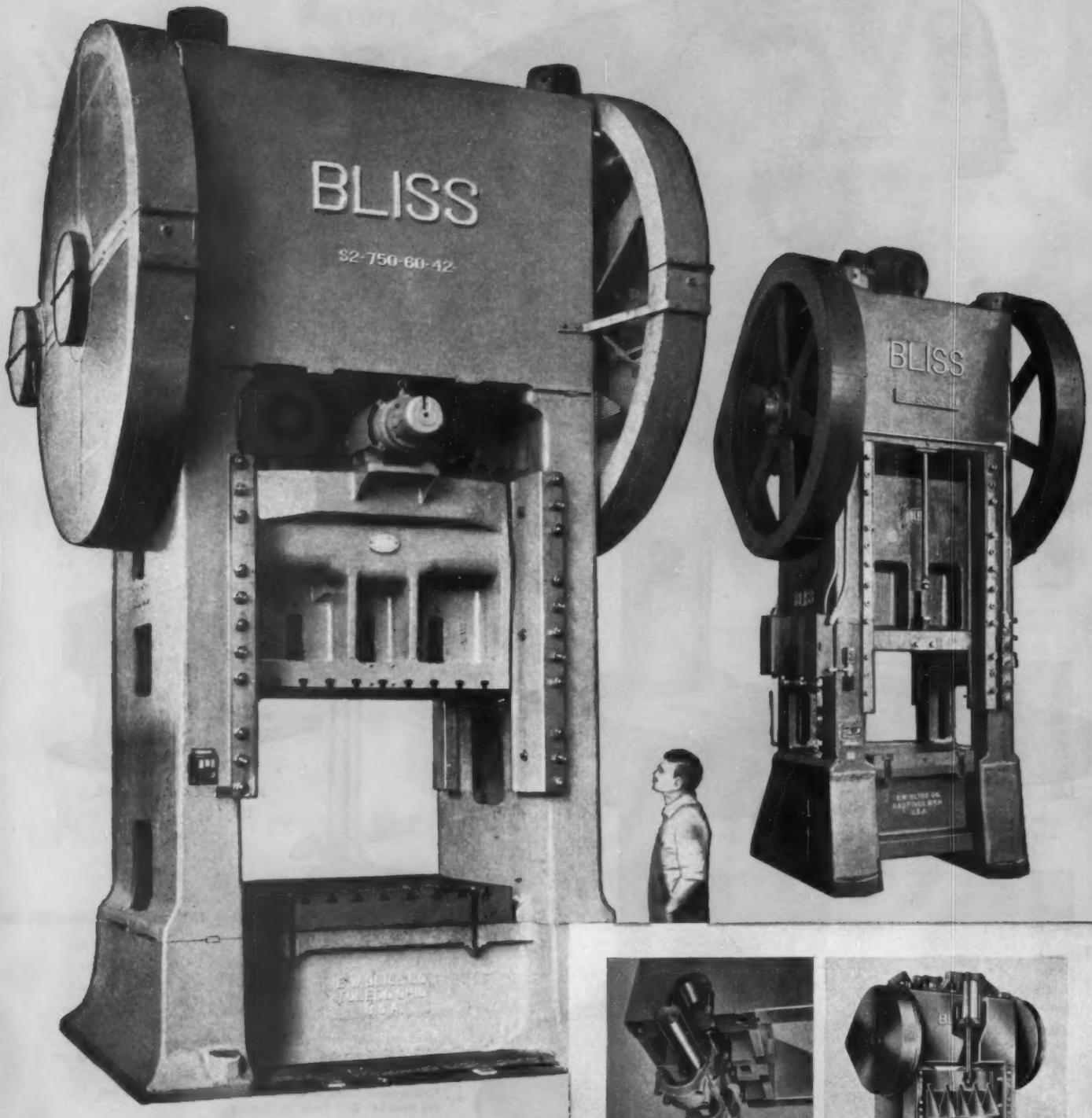
Name _____ Title _____

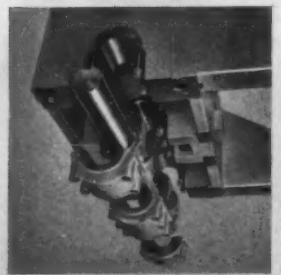
Company _____

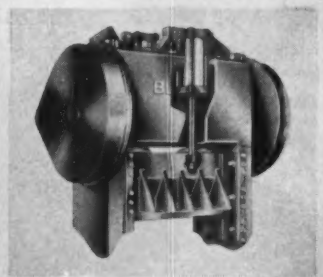
Address _____

City _____ County _____ State _____

THESE MODERN BLISS STRAIGHT







Heavy box type crown, above, is reinforced with thick internal ribs front to back. Deep sections and large bearings provide rigid support for heavy SAE 1045 forged steel shaft, holds deflection to a minimum.

Air counterbalance, top right, maintains upward tension on main bearings —compensates for weight of dies, prevents backlash in gears, and eliminates takeup in main and connecting bearings when tension is reversed.

SIDE PRESSES ARE NOW

FIRST CHOICE

IN AMERICA'S METALWORKING PLANTS

About five years ago, we completely redesigned our single and double crank straight side press line—modernizing the line, complying with Joint Industry Conference standards, and adding many new features that resulted from careful study of user requirements.

While the presses were still in the blueprint stage, the news spread through industry. Relying only on the prints, enthusiastic customers volunteered enough orders to give one Bliss plant a four-month backlog before a single part was cast!

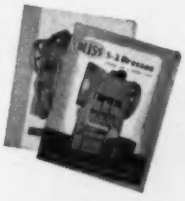
That enthusiastic acceptance is even greater today—with good reason. From the crown down these modern, rugged-duty presses offer as *standard* equipment unique design features like these—

- The new presses are heavier, with deeper, thicker box sections... larger bed and slide areas.
- They feature the long barrel-type connection, making possible a range of slide adjustments *100% greater than prior standards.*
- Gibbing is longer—slide is entirely within the gibs during working portion of stroke, *even when adjustment is down.*
- New cool-running air clutch with longer wearing linings is standard on most sizes.

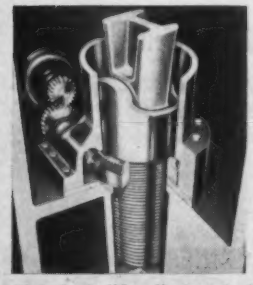
Thanks to these and other new features, Bliss straight side presses have been proved—in plant after plant—to hold their accuracy longer. They've been proved to render far longer die life... to minimize maintenance.

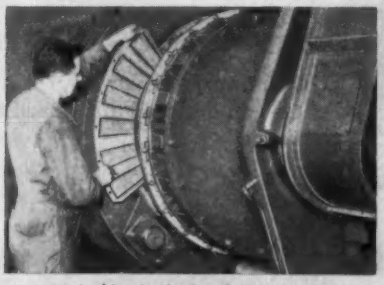
And yet their cost is *less* than you might think. To get the complete story on industry's most modern straight side presses, write today for copies of Bliss catalogs 17-D and 9-D. They're yours for the asking.

Want more information? Only the highlights of the Bliss straight side presses have been revealed here. For *complete* description of the exclusive design features of industry's most wanted straight side presses, detailed specifications, and a full listing of the standard single and double crank presses available, write today for our catalogs 17-D and 9-D.



Remember: BLISS for Presses, Rolling Mills and Special Machinery





Motorized slide adjustment, above, with locking brake has fully-skirted sleeve and long bearing surface to insure support through full limit of adjustment ... eliminates need for ring risers and stools.

Friction plates, top right, on both clutch and brake are easily removed without disassembling clutch or removing it from press. This feature alone saves hours of maintenance time.

BLISS

SINCE 1857

on your press is more than a name... it's a guarantee

E. W. BLISS COMPANY, Canton, Ohio

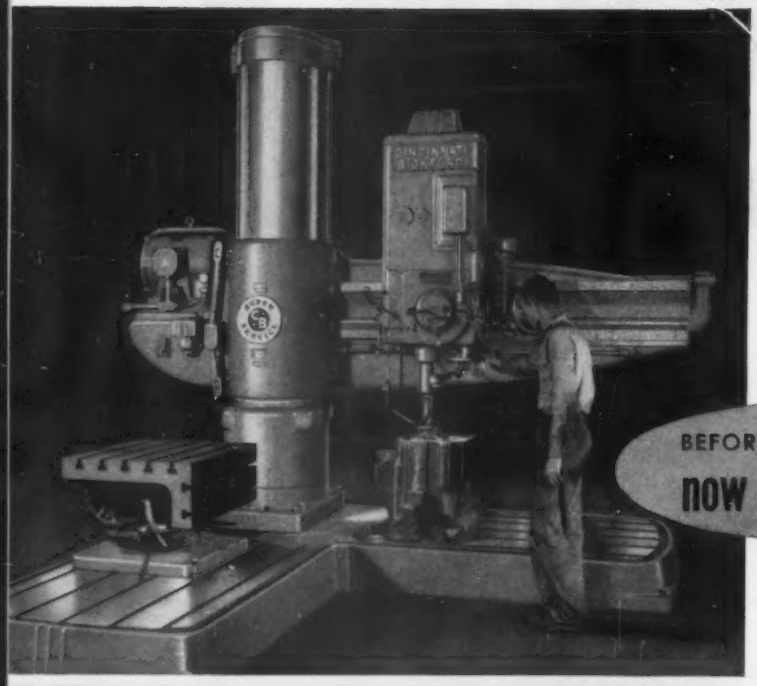
Subsidiary: The Die Supply Company, Cleveland, O.

E. W. Bliss (England) Ltd., Derby • E. W. Bliss Co. (Paris) France

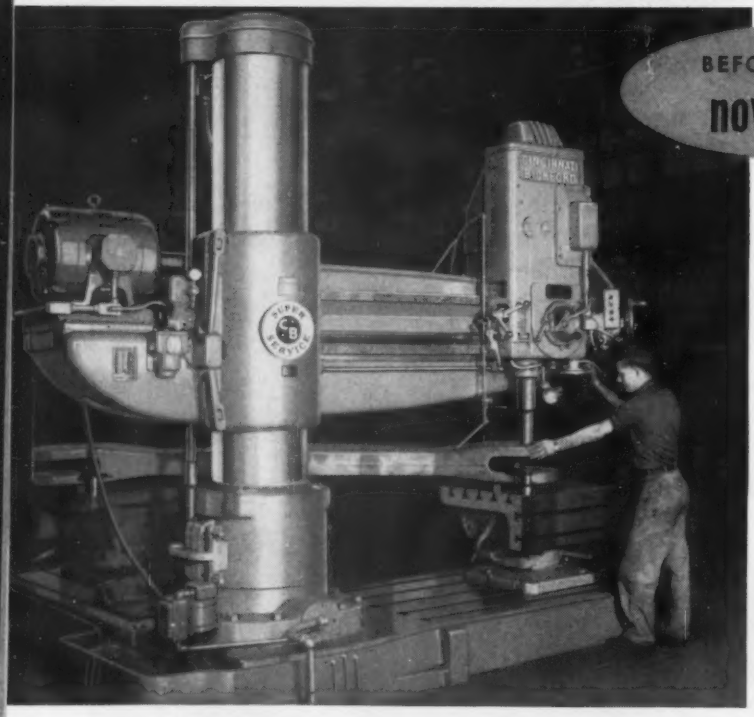
U. S. Plants in Canton, Salem and Toledo, Ohio; Hastings, Michigan; and San Jose, Calif. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, Washington, D. C. and Toronto, Canada.

Other representatives throughout the world.

BICKFORD cuts floor to floor time!



BEFORE 38 MINUTES
now 23 minutes



BEFORE 5 HOURS
now 3 hours

These two jobs are done with time savings at the Ohio Steel Foundry Company of Lima, Ohio.

The machine (upper illustration) is drilling breech rings for guns from 76MM to the 155MM size. In this tough material a 2½" diameter lead hole is drilled and opened up to a 3½" diameter with a core drill.

Machine, below, is drilling 3 5/16" lead holes in a 9-foot Ladle Vale. Holes are opened up with a single point boring tool. Time savings result from the outstanding ease of control, and the power and rigidity of Super Service Radial Drills.

For power, accuracy, easy handling, check on Cincinnati Super Service Radial Drills.

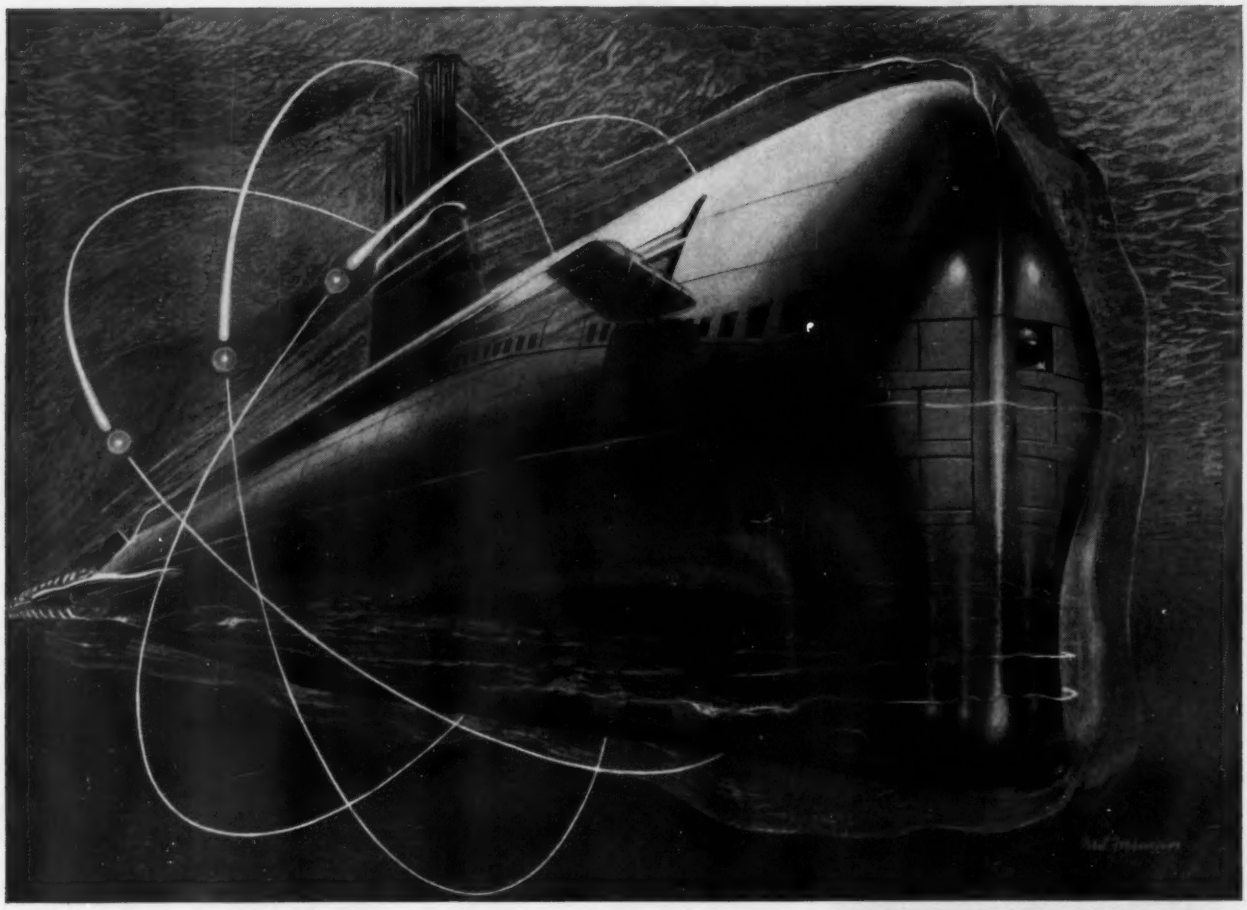
Write for Catalog R-29.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.



THE "NAUTILUS"

Atomic Sub and Builders Rely on World's Greatest Lubrication Knowledge

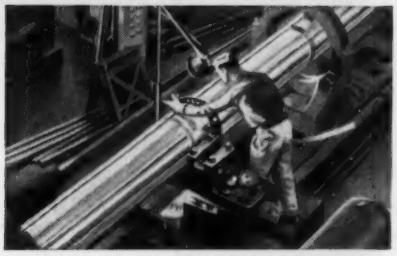
With the launching of the "Nautilus"—world's first atomic-powered submarine—the U.S. Navy crossed the threshold of the atomic age.

Socony-Vacuum is proud that it has been able to play a dual role in this most significant event.

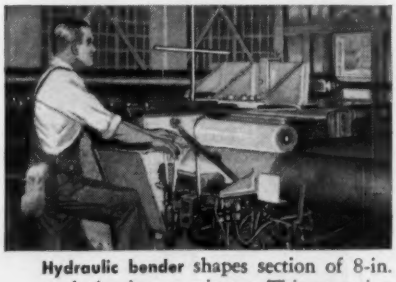
First, famous Socony-Vacuum lubricants are now protecting vital machinery aboard the "Nautilus."

Second, Electric Boat Division, General Dynamics Corp.—builder of the "Nautilus"—relies 100% on our lubricants and a program of Correct Lubrication to protect its plant equipment... has done so for the past 34 years!

We wish the "Nautilus" and her crew all success... pledge our continued cooperation, in every way possible, to the Navy and its suppliers, toward the end of keeping America and her allies strong.



A snorkel intake tube being machined to very precise tolerances on one of the large lathes in the Groton plant.



Hydraulic bender shapes section of 8-in. steel pipe in two minutes. This operation formerly took a full day.

SOCONY-VACUUM *Correct Lubrication*

FIRST STEP IN CUTTING COSTS

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

SOCONY-VACUUM

Keep Your on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

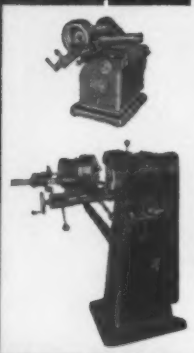
OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy — more perfect holes — more efficiency — longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to 1/2".

No. 510. For Drills 1/4" to 3"—2-3-4 flute.



OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

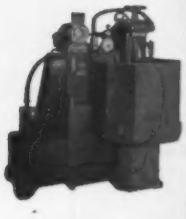
OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" —also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER



Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1 1/2" wide x 1 3/4" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Hail the Sales Engineer

The interesting article, "Today's Machine Tools: What Does Industry Expect of Them?" (*AM*—Nov 8 '54, p180) was the subject of lively discussion at a works group meeting. Automation was not discussed at length, as we are not mass producers, but the entire article was voted interesting and inspiring. The matter of salesmanship came in for much "in agreement" comment. Over here, machine tool makers don't seem to appreciate the value to their customers and, incidentally, to themselves, of salesmen who are qualified engineers and who know their product, design, execution, and capacity from A to Z.

There are signs of an awakening, it is true, but the salesman who can discuss the customer's production problem, who can authoritatively recommend the right machine, and who can guide and advise in the matter of tools and equipment is still a luxury we seldom enjoy. The majority opinion was that salesmen and manufacturers still look to the customer for suggestions, rather than the other way around. Examples were given of salesmen who had no previous connection with engineering, some who were entirely clerical, one selling small tools who had previously been in the soft goods line, another who had been a buyer.

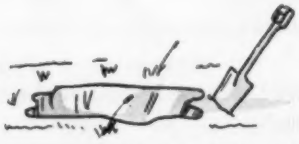
All were engaging personalities and fluent, if unconvincing, talkers. All were young, keen, agreeable fellows whom one could not dislike, but who could not be coaxed to make a definite recommendation or be lured into the shop to examine and advise on a production problem or machining snag. They take comprehensive notes of requirements for submission to headquarters and, in due course, proposals come along. But that is all such a waste of time. The conclusion of the discussion group was that, as long as the market for straightforward, standard machine tools remains well below saturation, customers can whistle for the revolutionary product hungered after by GE's Dr W W Gilbert. I don't quite agree with that finding but have to confess that that's how it looks.

It was a unanimous opinion that all machine tool salesmen should be

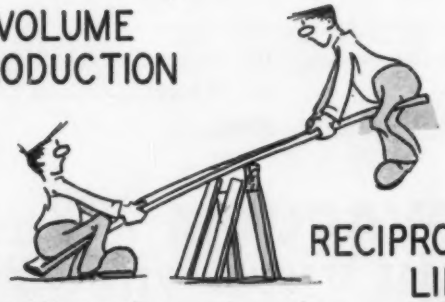
GRINETICS

By D G SMITH

VOLUME PRODUCTION



SELF-CONTAINED UNIT



RECIPROCATING LIFT

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LEWIS-SHEPARD *favors Faster Work Handling and gets it....*

with

LELAND-GIFFORD DRILLING MACHINES

As manufacturers of materials handling trucks, Lewis-Shepard appreciates the value of efficient work handling in their own production. They use Leland-Gifford Multiple Spindle Drilling Machines to speed drilling, reaming, facing, deep hole drilling and tapping operations . . . to step up both the quantity and quality of work produced — to save the time and energy lost in working with less versatile machines.

With Leland-Gifford Multiple Spindle Drilling Machines the right tools for the job are always ready to use, in the combination and sequence called for, with the right speed accurately set and checked by convenient hand wheel and the Leland-Gifford *Indicating Shift.*

The complete line of Leland-Gifford Drilling Machines offers you a wide choice of machine sizes, number of spindles, swings and types of feed. If precision drilling is part of your business, you should have complete information. Write for it today.

LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

- **CHICAGO 45**
  2515 West Peterson Ave.
- **DETROIT**
  10429 West McNichols Rd.
- **CLEVELAND 21**
  P. O. Box 217
- **NEW YORK OFFICE**
  75 South Orange Ave.
  South Orange, N. J.
- **LOS ANGELES OFFICE**
  2620 Leonis Blvd., Vernon 58, Cal.
- **INDIANAPOLIS 6**
  P. O. Box 1051
- **ROCHESTER 18**
  P. O. Box 67, Roselawn Station

PACKAGED PRODUCTIVITY

For all Sizes of Monarch Lathes*... For Quality & Quantity Improvements Like These!

The Monarch Air-Gage Tracer, proved in performance to be the most accurate duplicating device yet developed, can be factory-applied to almost every Monarch Lathe. So can the Auto Cycle Unit. Combine them and you get a fully automatic cycle high production lathe that can be converted to and from manual control in a matter of seconds.

Reasons for its productivity are simple. Less setup time. Simpler and infinitely less expensive tooling. Less tool sharpening time. Less turning time. Less grinding time on subsequent operations. To all this—add the speed, accuracy and inherent advantages of automatic control.

Don't you want more data on a package like this—as effective for short runs as long ones? Just write today for our complete, fully-illustrated Booklet #2607 . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
TURNING MACHINES

ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

TYPICAL MEDIUM LATHE APPLICATION

Monarch 16" Series 60 Engine Lathe with Air-Gage Tracer and Auto Cycle Unit

Turning rotor drive shaft. A flat template is used for this operation but round templates may be employed if desired. Stylus operates on only 5-6 ounces of pressure.

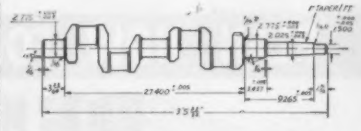
Part—helicopter rotor drive shaft, 36" long. **Material**—4340 steel forging, brought to hardness of 34 to 38 Rockwell C scale. **Operations**—finish turn and bore. **Limits**—±.001" on some diameters. **Comment**—accuracy and finish are the story here.

To obtain proper grain structure in the finished parts, the rough forgings are made substantially oversize. Finished parts average only 20% of the weight of the rough forging, and are completely free of distortion. User, having found previous modern equipment incapable of holding limits, expresses complete satisfaction with Monarch production.

TYPICAL HEAVY DUTY LATHE APPLICATION

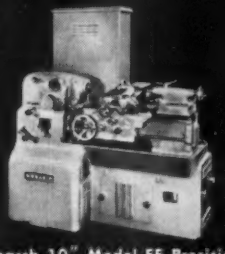
Monarch 20" Model M Heavy Duty Lathe With Type C Rigid Air-Gage Tracer

Turning crankshaft (above). Note that tool, mounted not on hydraulic slide but on its own slide, can be adjusted for diameter changes by dial calibrated in thousandths —without altering template setup.

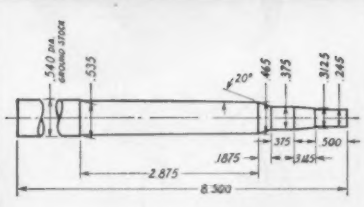


Part—crankshaft. **Material**—4140 forging. **Operations**—finish turn both ends. **Limits**—±.002". **Maximum depth of cut**—3/16". **Comment**—use of steady rest permits holding of limits, reducing spring normally present when turning such long, out-of-balance parts. With 2 cuts required on long end (above) because of large amount of stock removal from small end diameters — total turning time per piece is only 3 minutes, 5 seconds.

TYPICAL SMALL LATHE APPLICATION



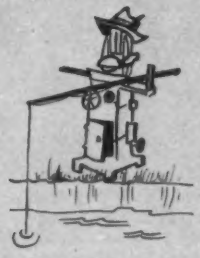
Monarch 10" Model EE Precision Manufacturing Lathe with Type C Rigid Air-Gage Tracer

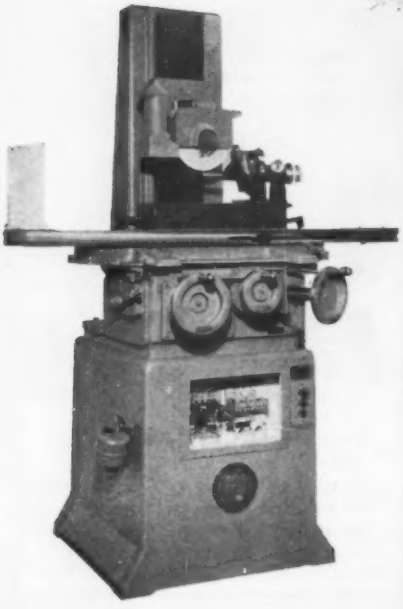


Part—reamer blank. **Material**—high speed steel. **Operation**—turn complete except .540" diameter. **Limits**—±.001". **Maximum depth of cut**—7/64". **Comment**—three cuts are required to avoid springing work. Yet total machining time of 3 minutes, 36 seconds was achieved at once by operator new to Air-Gage Tracer equipped machine. Customer estimates that savings will pay for machine in less than one year.

"How about a RETIREMENT PLAN for OVER-AGE Grinders?"

Actually it's a sensible idea! For recent surveys show that ONE out of every FIVE grinders now in operation is eligible for retirement, being incapable of meeting today's precision tooling standards.





Rather than pay a heavy premium in efficiency and profits, modern management finds that it makes sense to put over-age machines out to pasture, replacing them with REID Surface Grinders . . . for REID Grinders are famed as *precision* Grinders, preferred by industry for dependable accuracy

Your REID Dealer will show you how easy and economical it is to replace over-age Grinders with modern, efficient, REID Precision Surface Grinders.

PLAN NOW FOR REPLACEMENT

with **REID GRINDERS**

For the complete story on Reid Surface Grinders please write for Bulletin 618-1.

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

qualified engineers, specially trained in the product they are selling. They should be able to discuss convincingly the technical side of the customer's requirements with technical executives, and the practical side with shop superintendents. They should go into the shop and examine the proposed site, and should be able to point out any disadvantages which that site may have on the accuracy or general efficiency of their product. If the proposed site is near heavy hammers or lathes taking intermittent roughing cuts, the expert engineer salesman offering high-precision machines should spot that and any other limiting factors, and be able to suggest appropriate remedies. In short, the really qualified engineer salesman should know exactlv the minimum conditions under which his machine will operate successfully. If the proposed site does not offer those conditions, he should be able to advise as to how it can be prepared to do so. In all cases, he should get the customer's views before making a final decision.

C Donald-Mackinnon
Glasgow, Scotland

Challenge

Concerning the controversial article, "Continuous-cast bar replaces sand castings," (*AM*—Oct 25 '54, p121), we challenge your abstract statements about the time to manufacture a certain part; the average per cent savings by use of certain sizes of bar. We feel certain that a larger inventory of bar stock is required when using longer bars.

All good cast bronzes can be machined at the speeds you claim, and with tool life equal to, or in excess of, 15,000 pieces, depending on good tool design and good machine tools; in short, by modern methods.

It is stated that one type of bearing material has more consistent structure than another. This consistency depends upon the accuracy of control exerted over the process. We know that Asarco does use good technique and control methods. We deny that they are unique in this respect.

What they say is true about any bar stock which has finished OD and ID surfaces. Cast bronze bearing manufacturers have been preaching for almost 50 years that finished bars will accomplish a saving to the consumer. Further, manufacturers of bearings have been able to prove that an expert team can fully machine and produce a finished bearing to better advantage than an individual customer who tries to maintain a foundry and machine shop. The subject company has taken one progressive step, (eliminated the foundry problem), let them take the next step by eliminating the special machining facilities they must maintain for the manufacture of their relatively small requirements.

Several good cast bronze foundries are still in operation.

David C Spaulding
The Bunting Brass & Bronze Co.
Toledo, Ohio

He Invented It

I am trying to discover who originally invented the monkey wrench. Can you help me, please?

J E Hawkins
Cincinnati

Sorry we can't give you the date, but you could get that from the US Patent Office. The monkey wrench was invented by Charles Monckey, of Brooklyn, NY and, if everyone had his rights, it should still be spelled with a capital M and a c. However, he sold his patent for $2000. We suppose the patent rights have long expired.—Ed.

for Special Service on Carbide "Specials"

GORHAM

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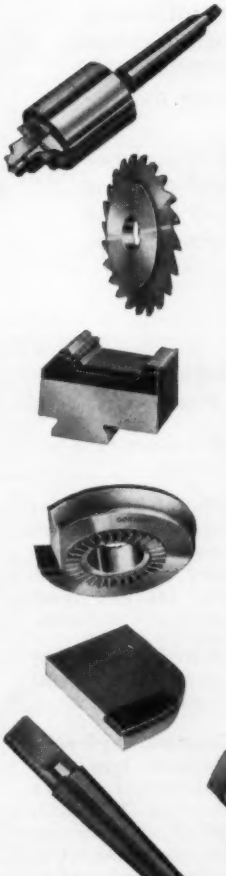
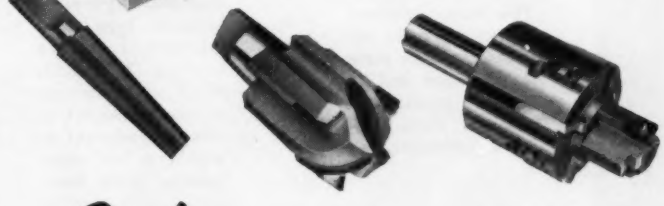


When your production machining problem dictates the use of special carbide tooling, your nearby Gorham Field Engineer can give you the right answers fast! He's an expert in the design and application of special cutting tools . . . and he provides a complete engineering service to determine your exact requirements.

He begins with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and required finishes and tolerances. He plots speeds, feeds and methods of tool driving. Then he develops practical design and metallurgical specifications for a special tool that's "tailor-made" for your application. And his recommendations are backed by Gorham's more than thirty years' experience in the design, manufacture and heat treatment of fine cutting tools.

Yes, your nearby Gorham Field Engineer is a helpful man to have around! If you haven't yet met him, write for his name, or send details of your problem direct, and we'll have him get in touch with you promptly.



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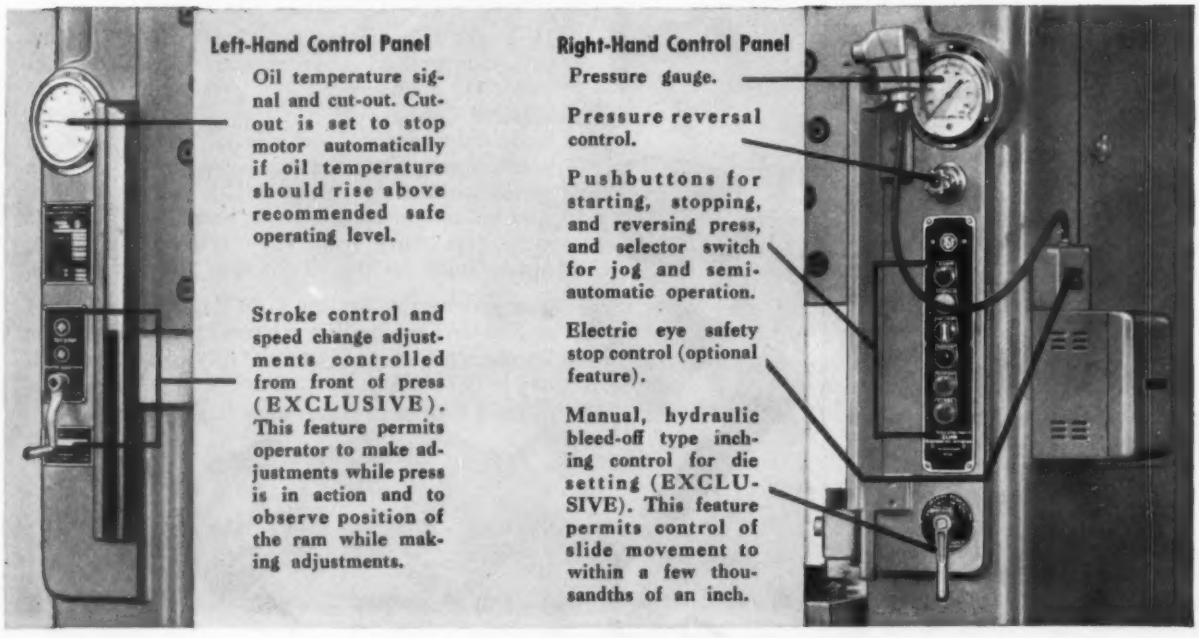
Illustrated and described below is the Elmes control system for single-action presses. (Note especially those features which are *exclusively* Elmes.) These same controls, plus additional control features, are provided on Elmes double-action presses.

Elmes engineers have the long and specialized experience that is all-essential for helping you solve your metal-pressing problems to the *best* advantage. And they're ready to do so at all times. For recommendations and cost estimates, see your Elmes Distributor, or write to us direct.

ELMES 450-TON
SINGLE-ACTION DRAWING
AND FORMING PRESS



Left-Hand Control Panel

Oil temperature signal and cut-out. Cut-out is set to stop motor automatically if oil temperature should rise above recommended safe operating level.

Stroke control and speed change adjustments controlled from front of press (EXCLUSIVE). This feature permits operator to make adjustments while press is in action and to observe position of the ram while making adjustments.

Right-Hand Control Panel

Pressure gauge.

Pressure reversal control.

Pushbuttons for starting, stopping, and reversing press, and selector switch for jog and semi-automatic operation.

Electric eye safety stop control (optional feature).

Manual, hydraulic bleed-off type inching control for die setting (EXCLUSIVE). This feature permits control of slide movement to within a few thousandths of an inch.

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Spot News of Metalworking . . .

Dim view of Germany's rearmament program . . .

is taken by West German hard goods manufacturers, who don't like the idea of switching from profitable civilian goods output to military orders that call for costly retooling — especially when no one knows how long the rearmament boom will last.

Tank production costs were just about halved . . .

by Cadillac in the four years that it produced the Walker Bulldog light tank. When Cadillac took over the contract in 1950, it cost about $145,000 to make a Walker Bulldog. By the time Cadillac wound up the contract this year, it cost only $78,500.

A 25-year-old Army private has patented a jet engine . . .

that, according to the Army, is lighter and more powerful than any now in use. The Air Force is taking a long look at the design — a combination of ramjet and turbojet — as a possible means toward lighter, faster fighter planes.

Asphalt "mothballing" for machinery . . .

will shortly be introduced commercially, at one-tenth the cost of present cocooning materials. Equipment is first covered with glass cloth, then asphalt is sprayed on. Result: a tough hide friable enough to break away when machine is de-mothballed.

Adhesive that replaces soft solder . . .

in the joining of certain metals is announced by the Army. Its use could cut costs in half in, for example, output of bomber tail fins. It's called "Araldite 115" — an epoxide resin.

Volkswagen's 1955 output is already "as good as sold" . . .

according to the German firm's spokesmen. Volkswagen expects to produce 300,000 vehicles this year — exporting 55% of them, already has firm orders for 40,000.

Electrical-discharge machining service . . .

is being offered to Metalworking industries by Electrosize, Inc, of Schiller Park, Ill. Service includes research and development, dies, molds, grinding, form drilling and production of precision parts from carbides and other hard metals.

Anti-Communist bonus . . .

of about $18 will be paid by Fiat of Italy to every non-communist worker who has "collaborated fully in the progress of Fiat."

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Efficient processing, **including careful heat treating, in the Continental plant; skilled craftsmen working with modern machine tools.**

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CONTINENTAL TOOL WORKS

CTW

DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

Washington . . .

• Why We "Broadened the Base"

• Titanium Expansion Program

• More Defense Contracts for Small Business

Reason for the Switch to a "Broad Base" ...

procurement policy on the part of the Defense Dept recently was this: a government study showed that 75% of all military and defense-supporting production would be concentrated in 22 cities under full mobilization.

That's why the Pentagon's new policy allows payment of premium prices to high-cost producers who are geographically dispersed. Electronics manufacturers, particularly, are crammed into target areas, but on the other hand, only 32% of ammunition suppliers are in these areas.

Mobilization planners would like to move up to 40% of military production outside the 70 most critical US target areas. Though the goal is strictly academic, it's felt that the new policy is a step in this direction—at least for new military items.

The new procurement policy is aimed at activating multiple supply sources for the 970 end-items on the Pentagon's "Preferential Planning List," which accounts for the bulk of military hard goods buying.

Under present production schedules, as many as 380 of the items are bought from single sources, but under the military production allocation plan, which sets up planned suppliers under full mobilization, almost all items have from two to eight sources.

For example, there are 17 current or planned suppliers for 105-mm shells. Only exceptions to the multiple-supply setup are the new weapons systems, like guided missiles, where processes haven't been carried far enough to bring in new producers.

Request for a New Reserve Tool Fund ...

for the 1956 military budget has been knocked out by Secretary Wilson. The services had sought additional funds to supplement the present $100-million "Vance Plan" fund. Wilson ruled that there are "enough" long-lead time machines on hand, or on order, already.

World's First Multi-Jet Attack Seaplane ...

Martin Aircraft's XP6M-1 Seamaster, has been unveiled by the Navy. Officials say it's the first water-based plane that can match comparable land-based planes in performance. They claim it "opens up a new frontier," and hint that Seamasters might be built as big as land-base intercontinental bombers "with oceans as landing fields."

GSA is Still Talking Titanium ...

with any firm interested in getting into the business (*AM*, Jan 3 '55 p142). Within weeks, a contract will be signed with DuPont calling for a 7500-ton plant at Waverly, Tenn. This would button up the present 30,000-ton goal, make DuPont the biggest primary producer.

GSA is also dickering with Titanium Metals Corp for a 4000-ton plant and Harvey Machine Co for a 6000-ton plant.

Aside from deals that are still cooking, here's how the government's titanium expansion program shapes up now: DuPont (3600-ton plant), TMC (3600 tons), Crane (6000 tons), Dow Chemical (1800 tons), Union Carbide & Carbon Corp (7500 tons). The last two are privately financed. DuPont received a $14.7-million loan for its first plant, TMC $15 million, and Crane $24.9 million.

Standby Price-Wage Controls ...

will be requested by the administration when the Defense Production Act comes up for extension next June. Two years back, when the law was last extended, several influential Republican and Democratic Congressmen tried unsuccessfully to tack standby authority on to the Act, but the administration was lukewarm about it at that time, and standby controls were ditched.

Pentagon Has Revamped Small Business Policy ...

pledging an "equitable opportunity (for small firms) to compete" in advertised and negotiated military procurement, and to engage in mobilization planning. The revised policy is aimed to set up a "more comprehensive and more effective" military small business program.

Meanwhile, the House Small Business Committee has blasted military treatment of small businessmen, charging that small firms are getting a diminishing share of defense subcontracts.

Says the committee's final report: the decrease in military business for small firms stems from factors other than defense spending cuts.

Among the factors cited: (1) installation of government-owned production equipment in prime contractors' plants that duplicate subcontractors' facilities; (2) delegation of responsibility to airframe contractors for delivery of completely fitted planes.

IN this cost-conscious era of close competition, there is a constant search for methods to reduce manufacturing costs. One way this is being accomplished by manufacturers of refrigeration equipment . . . is by making full use of the Microhoning process on vital functional surfaces of parts such as the bearing plate, crank case, main frame, front head casting, connecting rod, cast-iron housing, cylinders, pistons, and various small bushings.

What is Microhoning and how does it reduce manufacturing costs?

Microhoning is an abrading process that combines stock removal, geometric accuracy, size control and surface finish into one automatic operation. The rotating and reciprocating, automatically-expanding tool self-dresses its abrasives through its own motions, while faithfully duplicating the required surface finish.

The savings are in time, effort and equipment required to obtain comparable results by any combination of other means. Why not have a Micromatic Field Engineer discuss with you the advantages of Microhoning in your processing plans?

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Vol. 6—No. 4

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Detroit . . .

• Inside Story on Ford's Bonus Plan
• Chrysler Launches Giant Expansion
• GM's Capital Spending Plans

Ford Bonuses . . .

equalling a year's salary, and in some instances three years' salary, haven't been uncommon in the past. But that kind of bonus was out in '54.

Some Ford employees, for instance, were mildly displeased over a letter they received from Henry Ford II. The letter, dated December 13, dealt with Ford's "Supplemental Compensation Plan."

This plan was originally set up in 1947 and amended in 1948. Under its terms, an employee qualifies for a bonus when his monthly salary reaches about $750.

And in some instances, exceptional performance has been rewarded by bonuses equalling three years' salary. (While Ford spokesmen deny that bonuses have never been triple the annual salary, other company sources contend that such is the case).

The bonus amount, as explained in Mr Ford's letter to bonus recipients, is "essentially determined by three things: (1) company profits before taxes, (2) the number of individuals who qualify each year to receive a supplemental compensation award, and (3) the performance of the individual and of the company activity of which he is a part.

"In 1954, higher company costs have resulted in lower profit margins and substantially less income before taxes in 1953. At the same time, the number of employees eligible for supplemental compensation has increased substantially. Therefore, the general level of awards this year is below 1953's."

Ford told this column, "The estimated decline in profits before taxes will be about 5-6%." Profits after taxes, he added, would of course be "much higher" because of EPT expiration.

During the year, about 500 employees were added to the bonus list, and regular salary increases cut into the available bonus money.

Bonuses are 30-55% lower than a year ago, some Ford employees claim. "Not true," says Mr Ford. "If anybody was cut more than 20%, it was because he wasn't doing the job expected of him."

Ford's letter indicated there could be gratifying times ahead: "The company accomplishment this year, particularly in improved market position, has been outstanding. Such achievements can be translated in future years into larger profits and increased supplemental compensation, if satisfactory cost and asset control can be achieved."

As an incentive to continue working for Ford, bonus payments are divided, as the letter notes: "The amount awarded to you for 1954 . . . is $——. Under the plan, one-half of this award or $1000 (whichever is greater), after becoming final December 31 of this year will be paid to you on or about January 10, 1955, less taxes.

"The second instalment of this award will be paid to you in January 1956, assuming that the applicable conditions in the plan have been satisfied."

There had been speculation that bonuses were cut because (1) Ford no longer needs to attract top managerial talent by paying huge bonuses, and (2) Ford, in advance of a public stock offering, was trimming its sails with the thought that outside stockholders would frown on such high bonuses.

Neither approach, says Ford, is correct. "We are always looking for managerial talent." Without enlarging on it, he added that bonus reductions had nothing at all to do with stock offerings.

Chrysler's Giant New Expansion Program . . .

is good news for Detroit and the machine tool builders. Unattended to date by a formal announcement, Chrysler's program is aimed at enlarging its auto production capacity in Detroit — and probably in Los Angeles and Evansville, Ind.

A major long-range goal would be to insure that Plymouth output stays ahead of Buick's.

Other divisions won't be slighted either, as witness the beginnings of the expansion — a 40% increase in capacity at Chrysler Division's Detroit plant.

While Chrysler has not outlined the program, expansion is likely at such other Detroit plants as DeSoto (body, engine and assembly), Chrysler (body and assembly), and Plymouth (assembly).

Chrysler has lagged behind GM and Ford in postwar construction of branch assembly and sub-assembly plants. It'll cost millions to catch up.

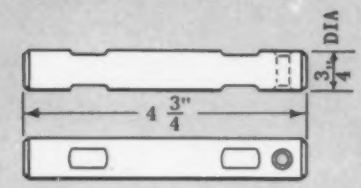
GM Plans to Finance Capital Expansion . . .

to the tune of $325 million by sale of common stock. GM's 1954 capital expenditures ran to about $750 million. Now, according to a GM release "expenditures in 1955, principally for machinery and equipment, are estimated to be in the neighborhood of $500 million . . . and there will be additional expenditures in 1956."

THERE'S ONLY ONE WAY TO DO A JOB BEST... *Another Production Solution*

by MOTCH & MERRYWEATHER!

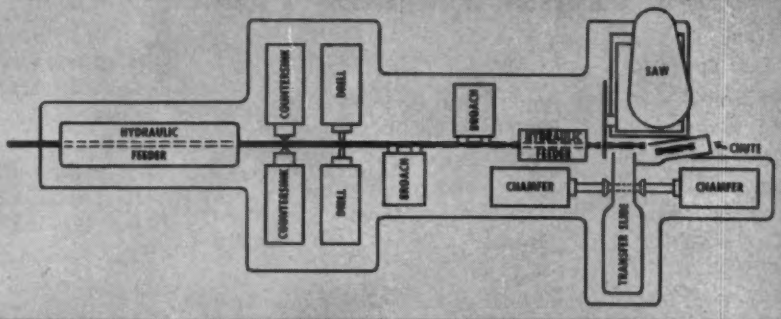
THE JOB TO BE DONE

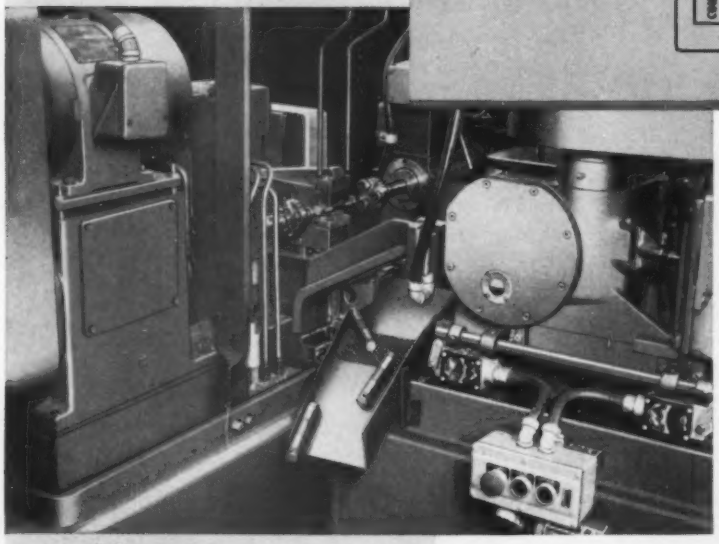


Part: Differential pinion shaft.

Operations: Countersink, drill, broach two sides, Triple-Chip cut off, and chamfer both ends.

HOW M & M DID IT BEST

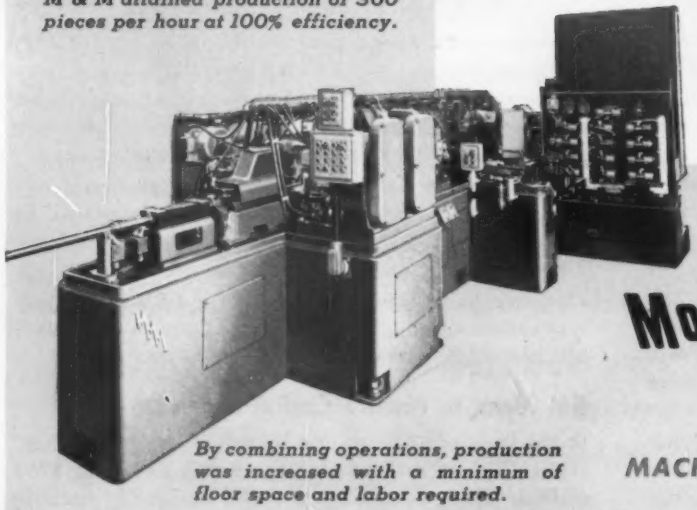




M & M attained production of 300 pieces per hour at 100% efficiency.

Again, the one best answer is by a Motch & Merryweather in-line automatic transfer machine, designed and built for this one purpose. In-line speedy progression — no wasteful starting and stopping — stock clamping at each station — automatic stock bar loading can be added for complete automation. *Result:* rapid fire production that quickly pays out. This in-line machine is but one illustration of a production solution by Motch & Merryweather.

Ask us now for any production-machining aids. No obligation.



By combining operations, production was increased with a minimum of floor space and labor required.

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MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, also Production Milling, Turning, and Special Machines

Machine Tools . . .

60 to 100 Machine Tool Builders . . .

will receive orders for long-lead-time machines under the Air Force's program for buying $84 million of reserve tools.

The eventual number is likely to be nearer 100 than 60. Some 1100 machine tools are involved, as outlined in an exclusive story on this page in our issue of January 3.

Testing and acceptance of these reserve machines will be in the builders' plants. Some of the machines, of brand-new design, will be installed temporarily in users' shops and given a good trial before the Air Force accepts them.

All the machines to be ordered will go into storage somewhere. None of the machines is for the Air Force's current production programs.

Costs are being studied of putting the machines in or near the builders' own factories, perhaps under the custodianship of the builder, and of storing the machines at central spots.

It is a safe guess that both methods may be used. There is no intention, in any event, of delivering the machines to aviation manufacturers until they need them for actual production (except in the case of trying out machines of radically new design).

Navy's $15 Million . . .

for reserve machine tools, its share of the $100 million Defense Department program, will be spent about like this:

Bureau of Air will place its $5,850,000 (or roughly that amount) through contractors.

Bureau of Ordnance, with around $6,450,000, will purchase machines both direct and through contractors.

Bureau of Ships will go through its routine procedure of asking for bids on its $2.7 million of tools.

Leasing of Surplus Tools . . .

for civilian use is in the news once more.

Allison Division of General Motors wants to lease from Army Ordnance 25 tools valued at $394,000 for two years, with option to renew the lease for three more years, to machine truck transmissions.

These tools, part of a production line for cross-drive transmissions and spare parts for combat vehicles, include a 42-in. lathe, gear cutters, drilling machines, boring machines, planers and grinders.

Defense Department has given its blessing to this proposal, which the Army claims will yield considerable savings in storage costs.

Office of Defense Mobilization has asked for more information about the deal. It is skeptical of the Army's claim, as the lease does not cover a complete "package" of machines.

McGill Mfg Co, Valparaiso, Ind, wishes to lease 18 pieces of equipment worth $272,000 for five years to make "competitive" commercial products.

15 Machine-Leasing Deals . . .

have been approved by ODM. Most recent case was the lease of a package of 48 machines to Tung-Sol Electric Inc, Washington, N J, to make miniature electronic tubes for civilian customers.

Average rental fees paid by lessees is 12.7% a year. Tung-Sol, however, agreed to pay 20% annually for five years, an amount equal to acquisition cost.

Small Business Administration, which has authority to recommend approval to ODM of military tool leases for civilian use, has backed the objection of the Business and Defense Services Administration to the Allison lease proposal.

Two machine tool builders, who received ODM approval to lease GSA-owned equipment for non-defense production, have withdrawn their requests. They believe that if they went through with their lease proposals they would be setting an awkward precedent for the machine tool industry.

At least one responsible Washington official feels that leasing of government-owned machines might be a good thing for everyone concerned.

Mergers and Consolidations . . .

are increasing in machine tool and allied industries.

Lodge and Shipley Co is in the midst of acquiring Hydraulic Press Mfg Co, but the technicalities involved will delay final ratification for 30-60 days. Corporate name of the latter company is expected to disappear, except as a division of Lodge & Shipley.

United States Industries Inc has bought Fray Machine Tool Co, which makes milling machines, milling machine heads and boring tools at Burbank, Calif. Fray production will be moved into the Vernon plant near Los Angeles of Axelson Mfg Division of United States Industries.

Baker Bros Inc has acquired certain assets of the Hall automotive equipment line of the Waterbury Tool Division of Vickers Inc. Hall valve-seat grinders and allied equipment will be made hereafter at Toledo under the name Hall-Toledo.

NOW MILL OR GRIND EXTERNAL or INTERNAL CONTOURS

(CAMS, TEMPLATES, BLANKING PUNCHES AND DIES)

- DIRECTLY FROM SIMPLE LINE DRAWINGS
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- IN MINUTES INSTEAD OF HOURS
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the ALL NEW Model 104 electronic CAM and TEMPLATE Machine

Using a new and unique non-contacting tracer control, the Model 104 works direct from simple, large-scale line drawings easily prepared with electrically conductive "ink". The contour of the drawing is reproduced at the milling head at **any reduced** scale, such as 5:1, 10:1, 20:1, or higher. Any errors in the drawing are proportionately reduced, resulting in extreme accuracy of the workpiece. Since neither model nor complex tooling-up is required, production costs are minimized. Built for continuous, heavy-duty operation, the Model 104 provides a wide range of spindle speeds (48 to 11,500 rpm) and ample power to assure efficient milling or grinding of practically any desired metal or alloy.

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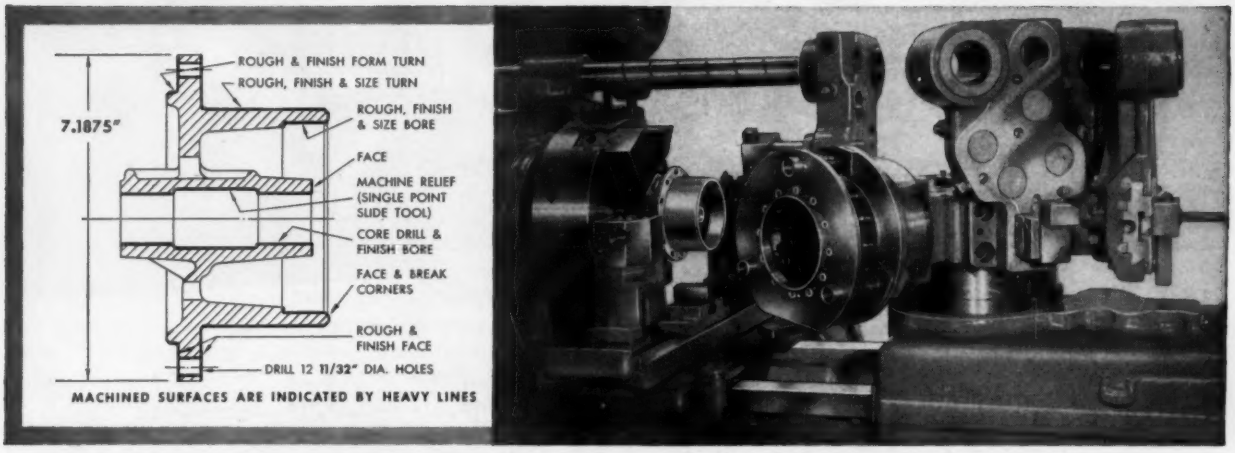
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MACHINED SURFACES ARE INDICATED BY HEAVY LINES

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The cast iron bearing spider shown required machining of twenty separate surfaces, plus accurate drilling of twelve, 11/32" dia. holes. A P & J Model 5-DELX POWER-FLEX performed all operations in a single, fully-automatic turret cycle . . . floor-to-floor time was just 7.96 minutes.

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The Model 5-DELX POWER-FLEX — like all P & J Automatic Turret Lathes — provides the power, flexibility and automatic operation needed for sustained high-volume precision production.

Send today for this Model 5-DELX Bulletin No. 131. If your production requires Automatics of smaller or larger capacity, you will find the right machine in the complete P & J line of Automatic Turret Lathes. Specific information on request.

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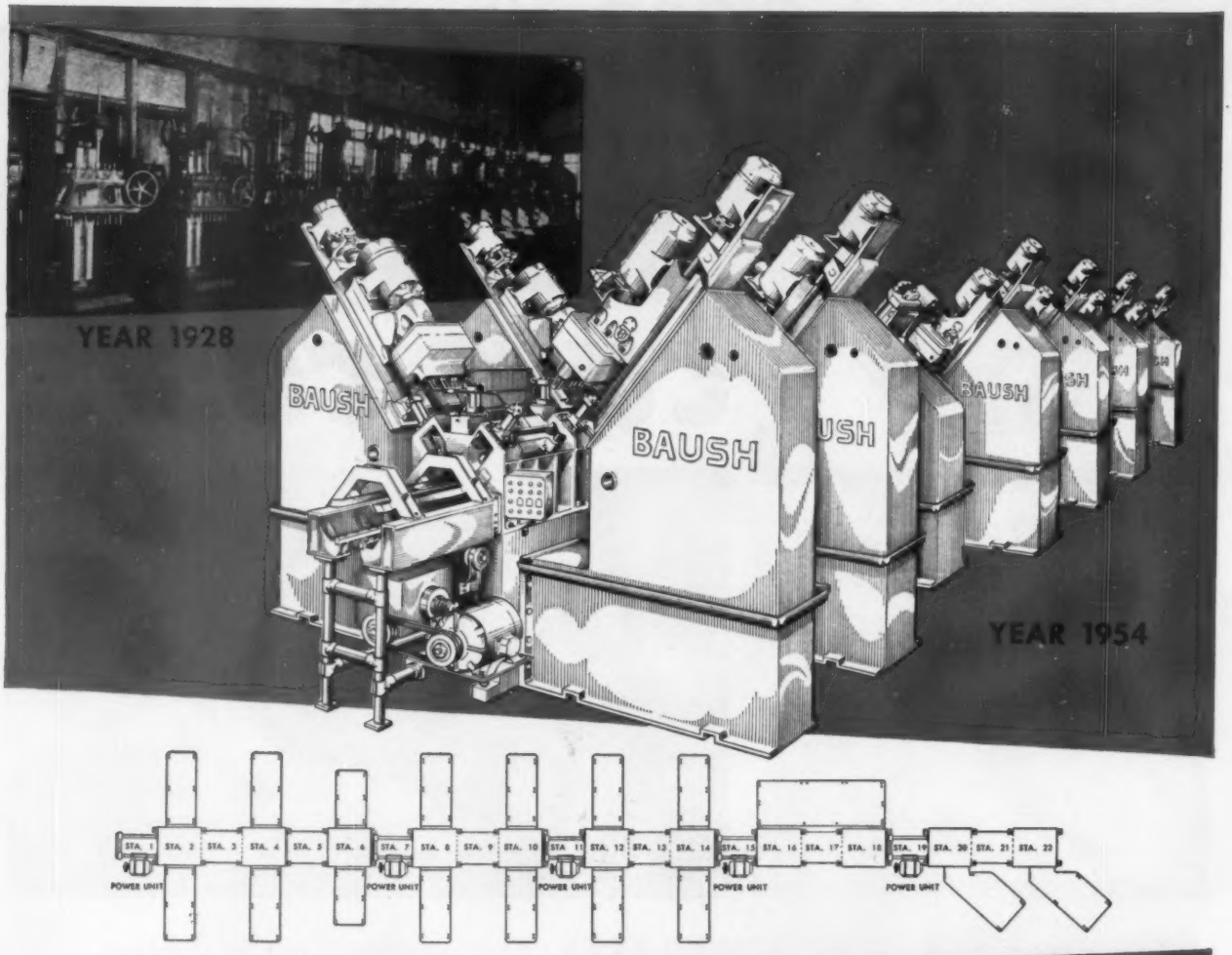

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completes 12,600 operations per hour to
MINIMIZE **. . . Labor Costs**
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This 22-station automatic transfer — designed for specific operations on a new V-8 engine — is another example of Baush ingenuity and "know-how" in machine tool construction.

Transfer consists of 22 stations with 5 complete machine sections with 14 Model "S" Leadscrew Units and 2 Hydraulic Units.

There are five 4-position Transfer Sections with arch fixtures and bushing plates — 2 checking fixtures — power units for transfer — hydraulic locating and clamping of part and 16 Fixed Center Ball Bearing Heads having a total of 105 spindles to complete 12,600 operations to drill, core-drill, chamfer and ream 120 cylinder blocks per hour.

Gaging Metalworking . . .

PRODUCTION INDEX
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	DEC '54(*)	NOV '54(p)	OCT '54(r)	NOV '53
Total Index	**158**	**156**	**149**	**159**
Machinery	123	124	137	
Electrical Machinery	203	197	185	
Autos	133	90	110	
Other Transportation	276	294	297	
Other Metalworking	127	126	136	

(*) Estimated (p) preliminary (r) revised

AN UPTURN IN METALWORKING PRODUCTION has surprised almost everybody. It has come at a time when Metalworking was thought to be lucky if it held its own, let alone registered a gain.

American Machinist's index jumped from 149 in October to 156 in November (1947-149 = 100). In December it went up two points more to 158.

TREMENDOUS OUTPOURING OF AUTOMOBILES in the final 60 days of 1954 accounted for this unexpectedly satisfying performance. An upsurge in televison manufacture helped out, too.

One should not be misled into believing, however, that this rush of activity is the forerunner of further advances in the weeks ahead.

Continued peak assemblies of automobiles the first quarter may be enough of a stimulus to keep Metalworking as a whole up where it has been the past 60 days. But that is not necessarily a safe bet.

AN INVENTORY BUILD-UP in preparation for a threatened strike in the automobile industry seems unlikely. There is no hint of such action to suppliers. They feel that Detroit will push assembly lines to the utmost and at the same time will avoid getting caught with a huge parts inventory in case a strike should come off.

Commercial stamping plants heavily leaning on the automotive industry have not yet had the normal seasonal influx of orders. Their backlogs stay around 18 weeks, against a norm of 26 weeks. New orders for auto stampings, in fact, are put at only 70% of the 1947-1949 base. Blame for this situation is laid at the door of automobile makers themselves who are doing more of their own stamping work than a year ago.

Most stampers are operating on a single-shift, 40-hr basis. Little hope is held out for booming business this quarter.

DEFENSE TOOLING ORDERS are giving tool and die shops a new lease on life. This is especially true of plants in Ohio, Indiana and Illinois. Enough new business is in the offing to assure a fairly good first quarter. Appliance manufacturers have recently been in the market for new tooling.

WITH CONSTRUCTION WORK TRENDING UPWARD, makers of construction machinery are sanguine about prospects for the year. They are convinced that contractors must start buying equipment in volume soon.

"WATERING-OUT PERIOD" for gray iron foundries — number of small producers who have gone out of business since the end of the Korean war — is about over. In 1954, some 135 foundries closed down, most of them liquidating their equipment. More than half were captive foundries. Outlook is for operations at 70% of the 1951 peak during the months ahead. Until recently output has been in the 57%-to-63% range. Many of the current orders pouring in are from Detroit.

NEARLY $4 BILLION OF AIRCRAFT WORK has been piled up by the southern California plane industry. This volume is only a bit less than it was a year ago. Yet the fact remains that aircraft volume in 1955 will slide down somewhat, but not alarmingly, from the 1954 level. Anticipating this drop, aviation parts people have stabilized their operations at lower levels and are trying to get into non-aviation products to swell the total.

Gaging Business . . .

PRICE INDEX

	DEC '54(*)	NOV '54(p)	OCT '54(r)	NOV '53
Total Index	**133.3**	**133.3**	**132.7**	**132.6**
Metalworking Machinery	**143.0**	**143.1**		**141.8**
Other Machinery exc. Electrical	**137.6**	**137.6**		**137.3**
Electrical Machinery	**131.5**	**130.3**		**131.8**
Fabricated Metal Products	**129.9**	**129.0**		**128.9**

(*) Estimated (p) preliminary (r) revised

"ROLLING RESURGENCE" is the tongue-twisting term that a leading economist is applying to general business.

Different parts of the economy are resurging (moving upward again after a downturn would be a simpler description) at different times. In plain terms, recovery is not coming all at once in all industries.

He singles out freight carloadings, an excellent barometer in themselves, for his illustration of resurgence.

All classes of carloading will not show improvement in 1955. Some 20% of total carloadings already have benefited from resurgence. Around 60% will feel it this year.

The broad classification of "all manufactured products" will begin to furnish more carloadings during the first quarter.

OUTLOOK FOR 1955 IS "GOOD," a term that means exactly that — not a super-boom year like 1953, but a year that by all ordinary criteria means above-average business for a lot of industries.

Take for instance the basic metals people. Steel looks forward to a 95-million-ton year. This means more than 7% better business than last year — and as steel goes, so go many industries.

Light and non-ferrous metals are doing well, too. Aluminum output for civilian use is at an all-time high, and is headed for another record year. Copper and brass output started to pick up in fourth quarter 1954, is still headed upward. And like steel, good business for the suppliers of these metals means good business for many industries.

Many segments of Metalworking are headed back toward 1953 peaks—some may surpass them.

Electrical manufacturing is headed for a 5% upswing this year; automobile and truck output should run 250,000 units ahead of 1954, and the appliance industry expects to recoup 1954 setbacks.

All in all, 1955 will be a "good" year!

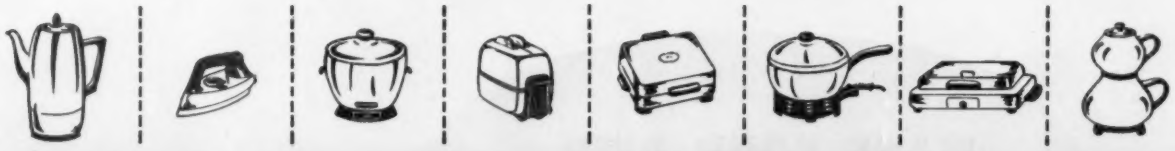
WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100) *	138.4	137.4	124.2
Steel ingot production (thousand tons)	1,943	1,850	1,798
Electric power output (million Kilowatt hours)	9,425	9,431	8,198
Production of automobiles and trucks	148,390	149,418	93,293
Engineering construction awards (*Eng. News-Record*, millions)	$414.9	$346.1	$225.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	191	272	180
Vacuum cleaners sales (thousands of units)	263	238	249
Washers sales (thousands of units)	339	380	311
Household electric ranges sales (thousands of units)	84	100	73
Radio production (thousands of units)	800	931	1,052
Television production (thousands of units)	921	948	680
Gear sales index (1947-49 = 100)	152.3	135.1	211.1
Foundry equipment new orders index (shipments, 1947-49 = 100)	147.5	68.3	87.1

* Seasonally adjusted



These 25 parts of Armco ALUMINIZED STEEL are used by one company in eight different appliances. They are electric toasters, irons, corn poppers, coffee makers, waffle irons, sandwich grills, deep-fat fryers and percolators. Parts include element pans, bottoms, baffles, handle and terminal brackets, crumb tray, shield and base plate.

Special Armco Steel CUTS COSTS OF 25 PARTS FOR MANUFACTURER

Here's what the manufacturer of electrical appliances gained by changing interior parts of eight products from plated metal to Armco ALUMINIZED STEEL:

LOWER COSTS

Elimination of plating ended handling, cleaning and racking costs as well as actual plating costs. This produced savings of as much as 10 cents a part.

BETTER PRODUCTS TOO

Efficiency of all appliances was improved noticeably. The high *heat-reflectivity* of Armco ALUMINIZED STEEL keeps heat inside where it belongs. This makes appliances easier on kilowatts, means lower table-top temperatures.

IMPROVED APPEARANCE

Many of these internal parts are partly visible. When made of plated steel they showed ugly discoloration from high temperatures. The Armco ALUMINIZED STEEL parts show no discoloration because of their fine *heat resistance*.

SEE FOR YOURSELF

If you make products or parts that require a combination of heat – and corrosion-resistance or heat reflectivity, investigate this hot-dip aluminum coated steel. It is made in sheets and coils 13-through 28-gage and in widths up to 48 inches depending on gage. For further information write us for the booklet, "Armco ALUMINIZED STEEL."

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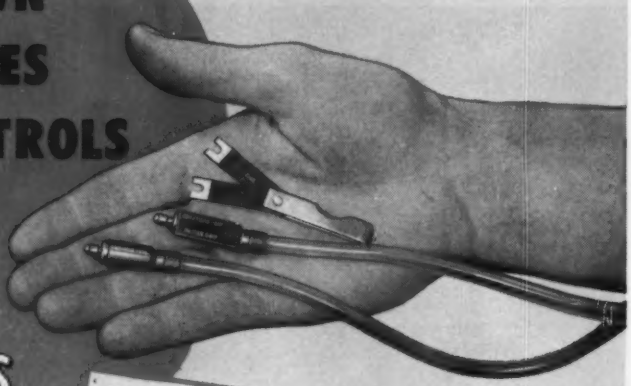

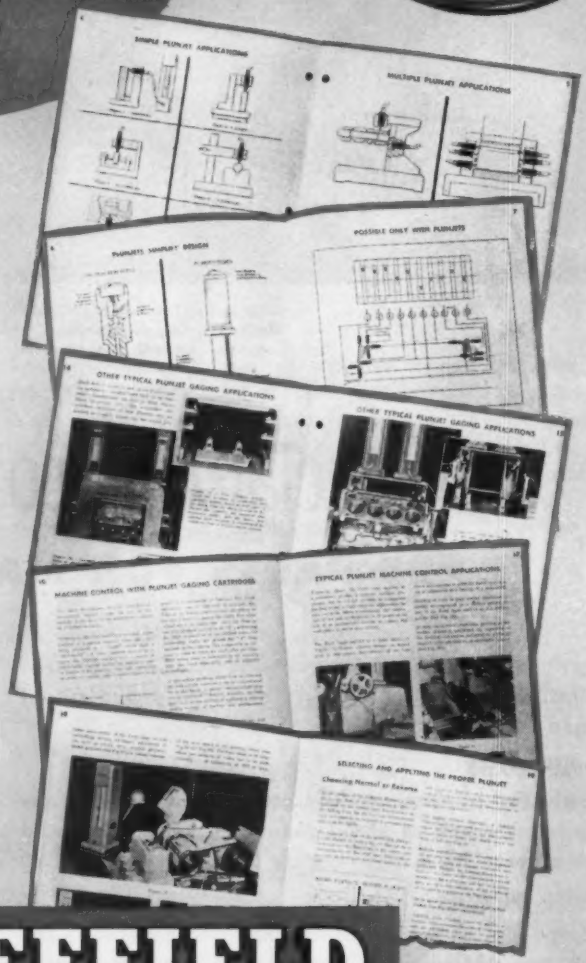

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Do Machines Cost Too Much?

Machinery and equipment prices are hardly a glamorous subject. For a long time, however, there has been more inquiry about them than about many other subjects.

That is why the recent study of machinery prices by the Machinery and Allied Products Institute is of more than casual interest. Its conclusions justify, with facts and figures, what numerous machinery builders have contended all along.

The study disproves the sweeping comments of some critics that machinery prices are way too high. The evidence is strictly on the other side.

Bureau of Labor Statistics show that machinery prices have increased since 1939 only at a moderate rate compared with industrial prices in general. They also have gone up less than construction costs or prices of component materials and supplies.

They have risen less than one-half as much as wage rates paid by machinery manufacturers or by machinery users (which is more to the point).

During World War II, machinery prices declined some 33% relative to the cost of an hour's labor to users of capital equipment. The average rate of the decline went up sharply compared with the years prior to the war. The explanation is simple: Machinery prices were frozen throughout the war at pre-existing levels, while wages were allowed to increase 40%.

Machinery prices, by 1947, were only 30% above the 1939 base, whereas industrial prices (consisting of all industrial commodities other than farm and food products) were up 64%.

From then until the outbreak of the Korean war, prices in all three classifications moved up at about the same rate. From mid-1950 until today, machinery prices have tended a bit to close the gap, but the spread between them and prices of industrial goods and construction costs still is impressive.

Much the same story emerges from a comparison of machinery prices and prices of component materials and supplies. It is all in favor of machinery prices.

To pin-point the price changes a bit, metalworking machinery and equipment prices were at 197 in October, 1954, with 1939 taken as 100. They had risen almost exactly the same amount as industrial commodities in general. By contrast, iron and steel prices had gone from 100 to 210, and non-ferrous metals from 100 to 232. Hourly wages had been hiked from 100 to 267.

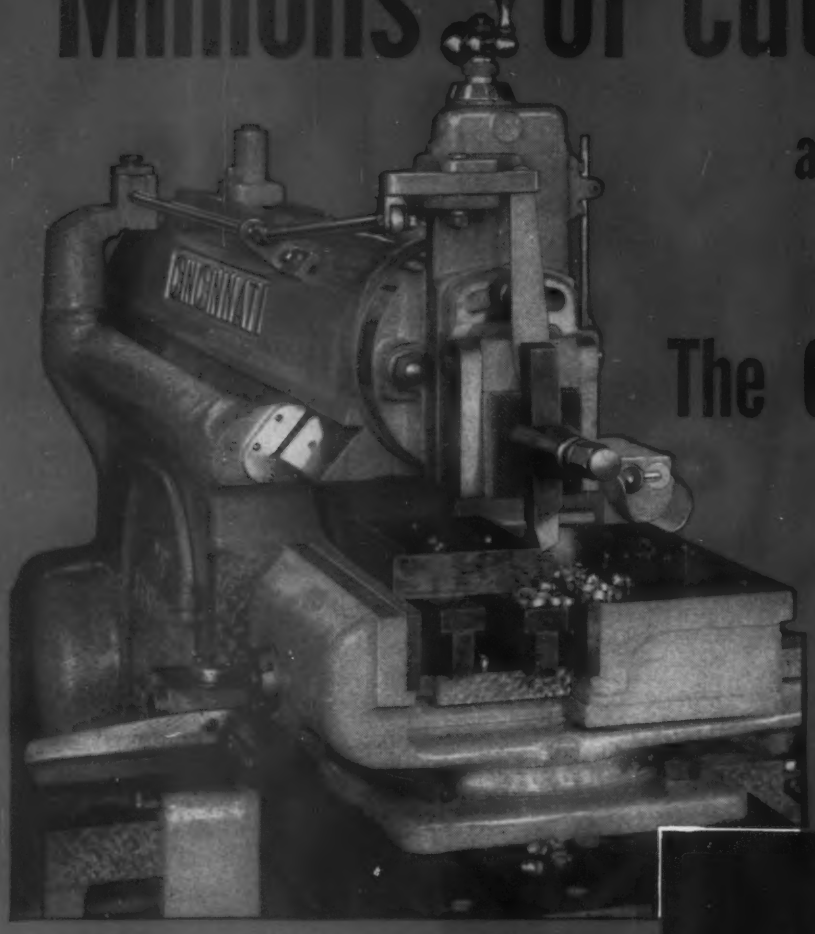
You might logically assume that these comparisons of machinery prices are for the same products in 1954 as in 1939. But that is not the case. Today's products bear the same name but only a general family resemblance to their progenitors. They are much bigger, stronger and can do a lot more work faster than their 1939 counterparts. They produce much greater cost savings.

The MAPI study has performed a highly useful service. It disposes effectively of the charge that machinery and equipment prices have ballooned.

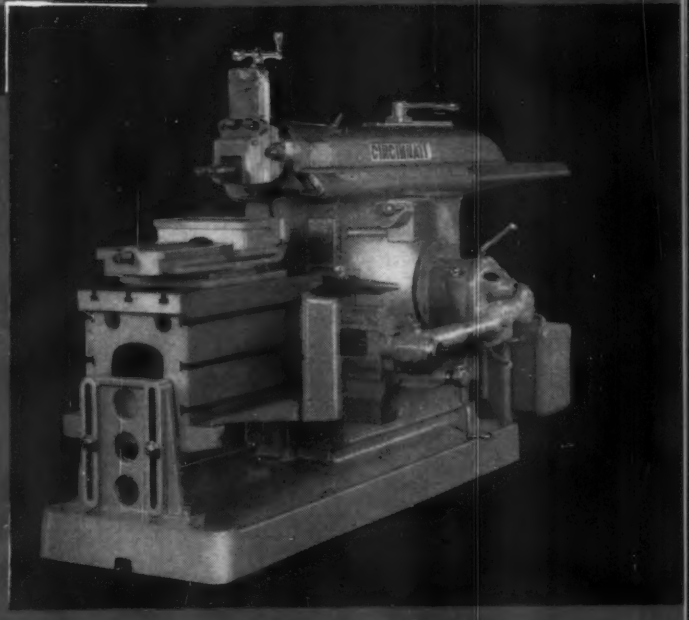
The facts, turned up from official government sources in Washington, support the view that machinery manufacturers have done a good job of holding down their prices despite constantly rising costs of almost everything going into their products, from materials to labor.

Burnham Finney

Millions of cuts without a fault...



The CINCINNATI Tool Lifter!



The dependable Cincinnati Tool lifter, with positive return and lift, eliminates tool damage—operates at high speeds—and with angular settings of tool slide or clapper box. Protects and permits use to maximum advantage of carbide or high speed cutting tools.

After simple setting it is automatic, relieves operator and increases production.

Write for Shaper Catalog N-6.

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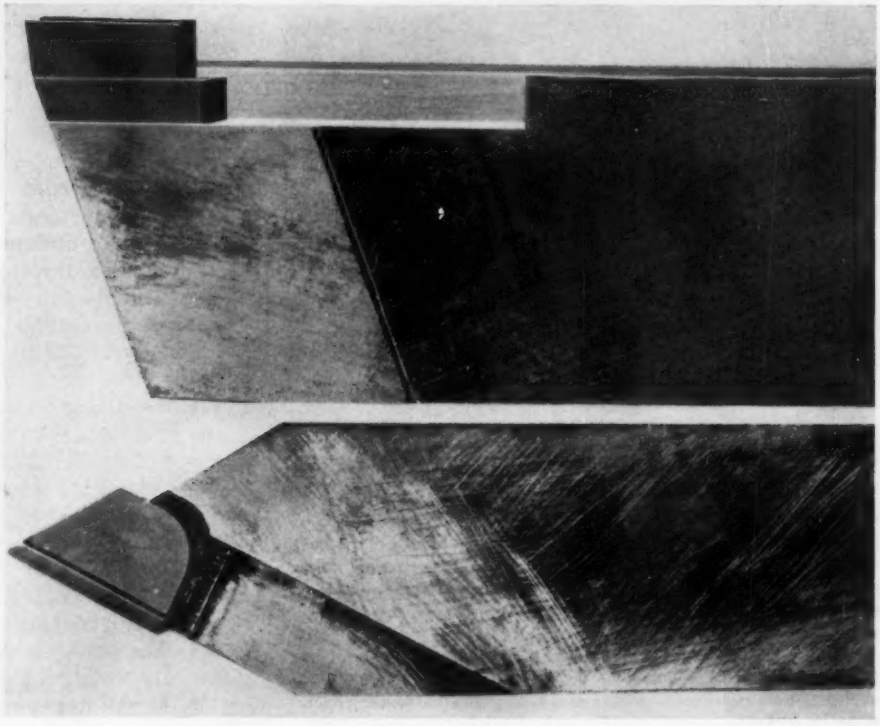
American Machinist



THIS DOUBLE-CARBIDE tool takes a ⅜-in. cut on SAE8720 forgings at 0.020 to 0.028 ipr feed and 350 to 730 sfpm on a New Britain + GF + copying lathe. The 3/16-in. thick shim of 55A was brazed to the shank with a silver solder. The grade 78 tip is in turn brazed to the 55A. Roughly, the 3/16-in. shim has the same resistance to bending as would 9/16 in. of steel (Young's Modulus is 2.9 times as great for carbide as for steel). The shim carbide has a transverse rupture strength of 330,000 psi, the cutting carbide only 195,000 psi, so the shim provides a firm, stiff support

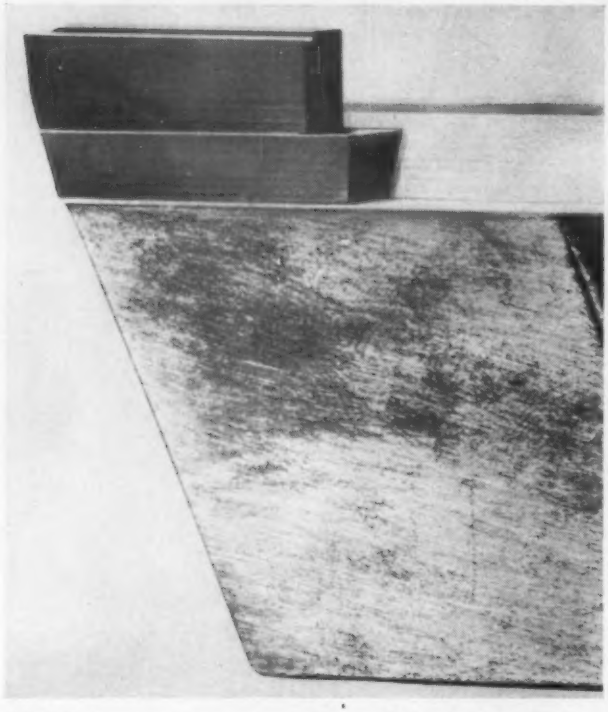
"Carbide shim" outdoes usual tools 5 to 1

Softer carbide, brazed between hard tip and steel shank, shows big savings on tough jobs. Also, a carbide cutoff blade side-brazed to steel shank outperforms conventional tools. Here are two tricks that may help in trouble spots

ROLAND F HUDAVERDI, Carboloy Dept, GENERAL ELECTRIC CO

If you want hardness, you yield toughness; higher wear resistance means higher brittleness, regardless of material. Every shop man has tried to find ways around this basic problem. Carbides are no exception; with the development of harder — but more brittle — grades, tool engineers have suggested "combination" blanks, hard on top but tough on the bottom, produced by combining different carbide mixes in the same piece. This has been tried, too, but the difference in shrinkage rates of the mixes makes them pull apart in the furnace.

But, after a recent talk on carbide characteristics at a meeting of The Society of Carbide Engineers in Hartford, Conn, Francis O'Sullivan and Steve Gregorczyk, both foremen at New Britain Machine Co, came up with a practical solution to the problem. They applied a soft, but tough, grade of carbide as a brazing shim between the steel shank and the hard carbide tip. The resulting



CLOSEUP shows relative positions of tip and shim in shank groove. Note also that the tip can be reground without fouling the wheel with steel. In brazing, the relatively tough shim apparently takes up much of the stress from differential contraction between carbide and steel (2 to 1) so the critical cutting blank is left unstressed. Heat transfer also seems to be better in cutting, because of large areas of contact, in contrast to mechanically held tools, where much of the tip is exposed to air or quenching action of the cutting fluid. Further, neither bottom clearance of tool in shank or groove tolerances appear to be so critical

tool overcomes the excessive chipping and cracking on heavy-duty machining of special steel forgings, holds to size, and saves a lot in first and regrinding costs. It outperforms conventional brazed tools as much as 5 to 1, equals or outperforms mechanically held tips. Large tip cross-section and narrow included angle, which caused high mortality from braze stress on usual tools, didn't in this case, tools can be made easily in any shop, and grinding is as easy as it is on conventional tools.

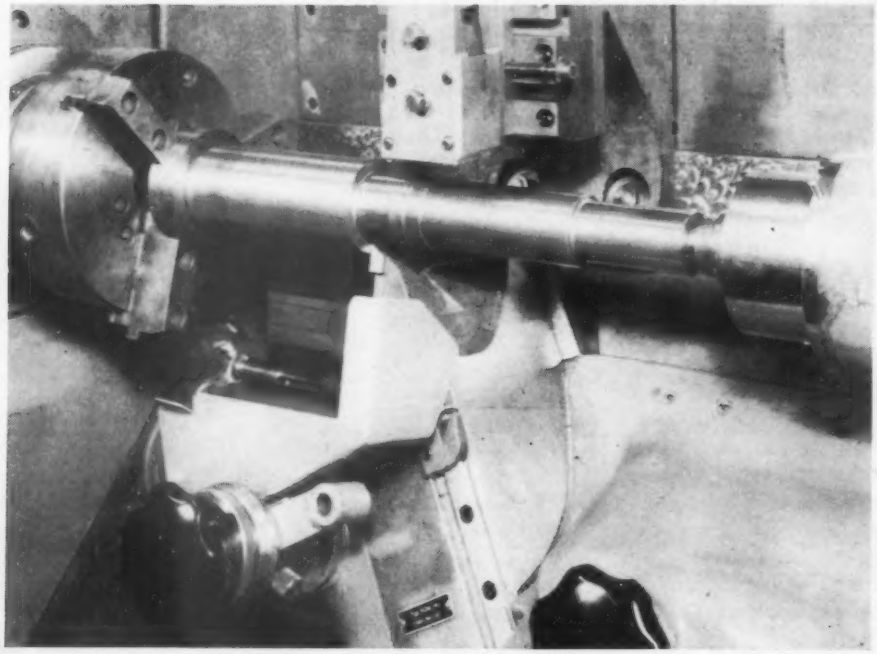
Best of all, costs are low. Actually, more regrinds were obtained from a Carboloy 0510 tip @ 2.48 than from a triangular slug TB12123 @ 4.24. About half the triangular slug is not used because it gets too short to hold, and mechanical holders cost $27 to $40. In contrast, the double-brazed tool can be bought finish-ground for about $12. Original investment is cut radically, and the accidents that smash tools in heavy cutting are correspondingly less costly.

Experiments were made in the Carboloy laboratory with hard grades of carbide in tools of this design, taking cuts ⅜ in. deep with feeds up to 0.093 in. Conventional carbide tools failed at 0.046 in. feed in these tests. General conclusions are those previously given, plus two cautions:

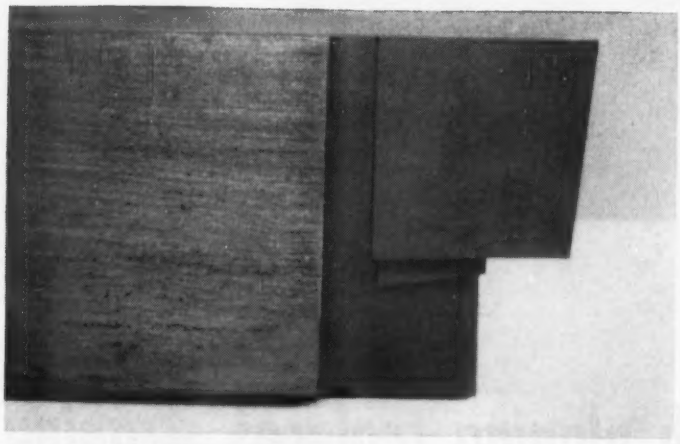
1. The design is not a cure-all; it will not compensate for machine faults.

2. It will not compensate for springiness in the workpiece. Work and machine must both be rigid.

Details of design and application are given in the illustrations, plus an additional idea for a cutoff tool.

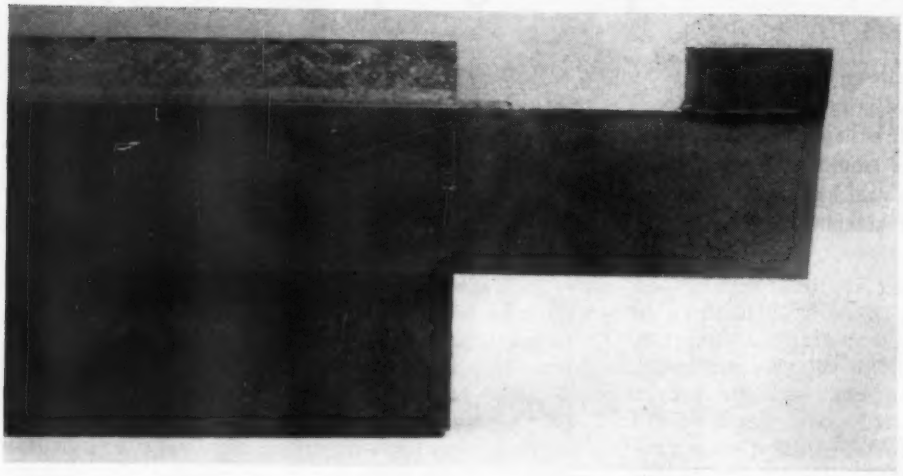


BI-CARBIDE TOOL in cutting position in New Britain + GF + lathe. Such a tool holds size even under heavy cutting load, in contrast to a mechanically held bit, where distortion seems to occur in the clamping band. Apparent fields of application for the bi-carbide tool include contour turning (commonly tools with narrow included angle); on heavy roughing cuts with large tools, where constant carbide failure occurs as excessive chipping or breaking of the cutting edge; on cuts where possible shank size must be limited; and of course where harder grades of carbide should be used with minimum stress on the carbide



For tough cutoff jobs, when carbide blades break too frequently and HSS wears out too fast, try one of these combinations:

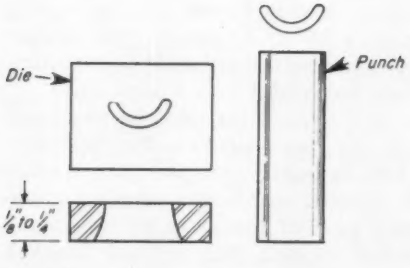
1... **WHEN TOOL OVERHANG** is not more than 9/16 in., braze a carbide blank to the SIDE of a steel shank. Braze ONE SURFACE only; do NOT step the steel. This tool resists deformation (will not "walk" sidewise), almost eliminates vibration and chatter, is inexpensive to fabricate in any shop



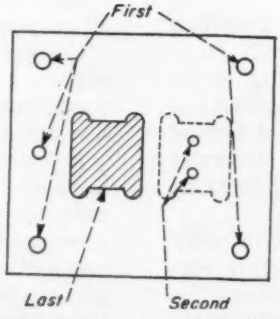
2... **WHEN TOOL OVERHANG** is over 9/16 in., braze a standard STB strip of 55A to the side of the steel shank, then braze a slightly wider cutting tip of a harder grade to the top. Grade 370 has been used to cut steels like B 1113 and SAE 4037 to dead center on automatics in this way

Diemaker's Kinks

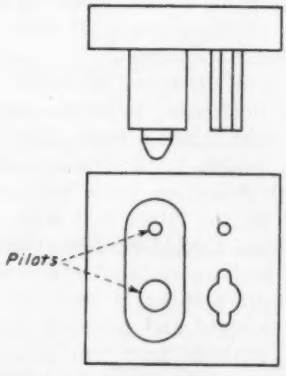
FEDERICO STRASSER



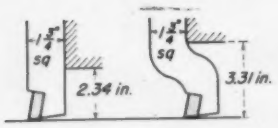
PUNCHES of irregular contour and like dimensions, if required in quantity, can be made in this way: Make a hardened die with an opening like that of the cross-section of the finished punches. Rough machine the punches and shear them into the die.



SEQUENCE of machining die plates is important. First, put in all holes for dowel pins, screws and stop pins. Second, machine piercing holes. Last, put in the blanking hole. By following this sequence, you are less likely to injure important cutting edges.



PILOTS in progressive dies need not be of the same shape as the outline of holes pierced in a preceding station. If the hole is not round, the pilot (usually round) need touch only the chief or more important contour of the pierced hole.



TOOL SHANK can be straight or curved; it must be *rigid*. Curved tools provide better finish when overhang is large

RUSSIAN REPORT ... III

How finish planing replaces scraping

One weakness in Soviet productivity is the lack of skilled mechanics; scraping and grinding require more than ordinary ability. Hence, it is important to minimize these operations. Here are the results of a study done in Russia to achieve this goal by using a final planing operation instead of scraping or grinding.

Scraping can be eliminated in many cases, and reduced 60 to 70% in the manufacture of guide surfaces, by utilizing finish planing techniques, says M Ya Karpov, in *Vestnik Mashinostroeniya*, No 2, '54. However, planing must be done with a specially designed cutting tool and a depth of cut under 0.004 in. on a machine kept in first-class condition for this kind of operation. Use of a straight-line cutting edge plus an appropriate coolant enables production of a 3 to 12 mu-in. rms surface finish. Surface accuracy depends upon the accuracy of the relative motions of the machine-tool components. Any accurate machine tool having automatic feed driven through wide helical gears, or hydraulically, can be used for this purpose. But *the planer used for finishing should never be issued for roughing* or even routine planing. It should be maintained as a precision machine.

In the direction of table movement, deviation from horizontal must be less than 0.00025 in./ft and never more than 0.003 in. over the entire table length. In the transverse direction (across the table) deviation from horizontal must not exceed 0.001 in. for tables 5 ft wide and wider. Generally speaking, these conditions require a special machine base and an isolated concrete foundation.

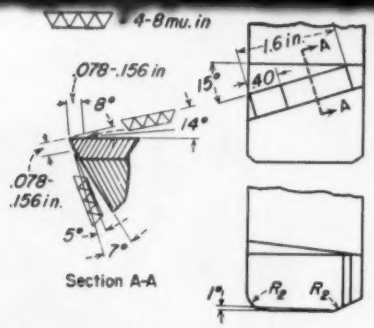
Finish planing is best accomplished with work that is rigid and provides a large supporting surface, without any cantilever or thin sidewalls in a direction perpendicular to the direction of cutting-tool movement. Also, the work should not contain too many "windows" or lightening holes, nor too many horizontal "shelf areas." Work configuration must be such that curvilinear cutting tools having an overhang of less than 6 in. and straight cutters having an overhang of less than 2½ in. can be used. Work must be set up with a table clearance of 0.001 in. and non-uniformities in the supporting surface must be compensated by shims. When the work is fastened into position on the planer table, side clamping should be weakened unless convexity at the work center is desired, in which case lateral clamping is tightened. "Clamping" of very large work can be done by supports which merely prevent displacement.

Tool shanks can be straight or curved, but they must be *rigid*. Curved tool shanks are more difficult to manufacture but, for a large overhang, they do provide a better surface finish. Special holders are designed because cutting tools take a very shallow cut. A particularly good surface quality is achieved with a very sharp cutter removing a powdery chip. Cutting tools for finish planing should have a rake angle of 8 to 10° and a relief angle of at least 5°. To insure smooth engagement and disengagement, the cutting tip should be inclined 15°; thereby the top of the tool also is protected from shocks. To minimize tool marks, a 0.400-in.-long section of the cutting edge is made conical at an angle of 1 to 2°. The most important requirement for obtaining good surface finish is quality grinding and lapping of the cutting edge. Surface quality is directly proportional to cutting edge quality if all of the other factors are right.

Cutting tools are carbide tipped and the cutting edge is ground to a 16 to 32 mu-in. rms surface finish, then lapped to produce an absolutely straight line and a surface finish of 4 to 8 mu-in. rms.

It is essential that the cutting edge be absolutely horizontal, as is the work surface. For this purpose, the tool, first, is lightly clamped with a single screw and then lowered onto a ground plate previously placed on a part of the work surface which was planed earlier or spot finished and checked. Next the tool is adjusted until no light passes through the plate-to-cutting-edge contact line and it is clamped for cutting.

Planing is done in two operations, the first cut to a depth not exceeding 0.020 to 0.030 in. and the second (final) cut to a depth of 0.002 to 0.003 in. Cutting speed for carbide-tipped tools is 50 to 70 fpm for the first operation and 12 to 40 fpm



CUTTING TIP of curved-shank tool intended for very small depths-of-cut. Tools are carbide tipped, rake angle is 8 to 10°, with 5° relief. Tool is inclined 15° to insure smooth engagement. Edge is ground and lapped

and grinding

for the finishing cut. As the surface area increases, the cutting speed should be reduced. Transverse feed is a function of cutting-edge width.

Using kerosene or a 0.03% solution of potassium bichromate will improve the surface quality of the work. Kerosene is of considerable benefit; it will produce a slightly darkened but smooth and shiny surface. Bichromate provides a brighter colored surface but, before wetting, oil must be removed from the surface to be machined.

APPLICATIONS

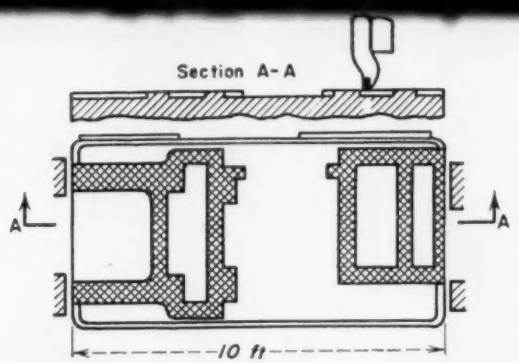
The bed and gear housing of an automatic lathe were finish planed on a machine with a 200-in.-long table. Clearance between the table and the work was 0.003 in.; paper spacers were used. Planing was done in three operations, first with a depth of cut of 0.004 in. and a cutting speed of 60 sfpm. Transverse feed was ¾ in. per "double-traverse" (probably one stroke — some foreign planers cut in both directions). In the second and third operations, the depth of cut was 0.002 to 0.003 in., the machining speed was 26 sfpm, and the transverse feed was 0.500 in. per double-traverse. The first operation was done without coolant, after which the surface was thoroughly wetted with kerosene and, during cutting, kerosene was fed to the tool in small quantities, from an oil cup.

The non-uniformities of the finish-planed surface were within the limits of 0.000080 and 0.000120 in.; deviation from the straight line of the planed bed surface did not exceed 0.0012 in. For this job, scraping required 35 hr of manual labor. It was completed on the planer in 4 hr.

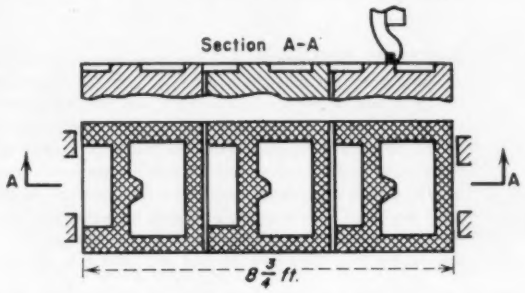
700 min. scraping time on the mating surface of a gear box was reduced to 80 min. of planing time.

Guide surfaces on a machine-tool bed (upper and lower horizontal plus front and rear vertical) were finish planed in 8 hr. To improve lubrication, scraping was still necessary, but it was completed in 20 hr instead of the 77 hr required without the finish-planing operation.

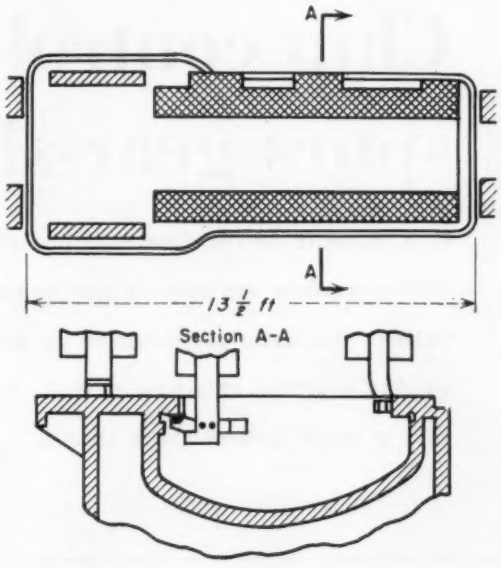
10,00 man-hr were saved on a single planer by using finish planing to replace scraping and grinding on only 34 pieces.



LATHE BED set up on planer table prior to finish planing



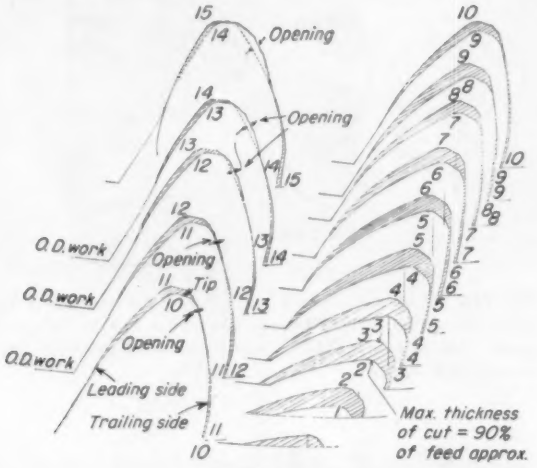
GEAR BOX was finish planed in 80 min. Previously, scraping operation required 700 min.



GUIDE SURFACES in a machine-tool bed were finish planed, then scraped in a total of 28 hr against 77 hr for scraping without planing

ACCURACY OF FINISH-PLANED SURFACES — MACHINE-TOOL BED

Surface Machined	Nature of Inaccuracy	Value of Inaccuracy-in. (entire bed length)
upper guide	Deviation from straight line	0.00117
	Deviation from parallel	0.00039
lateral guide	Deviation from straight line	0.00117
	Deviation from parallel	0.00273
lower guide	Deviation from straight line	0.00117
	Deviation from parallel	0.00234



3 DP 20°PA
15 TOOTH CUTTER
24 TOOTH WORK
0.100 FEED INCREMENT
SCALE 10X

SUCCESSIVE CUTS ON GEAR SHAPER - NOTE OPENINGS, OR VOIDS; ALSO SMALL CUT AT TIP OF TRAILING SIDE

The problem . . .

SUCCESSIVE CUTS are taken by a gear-shaper cutter as a tooth space is produced when generating a gear. Each cut differs from the previous one—note particularly cut No. 11 which will be studied in greater detail. On this cut, a slight opening exists at the tip of trailing edge of cutter tooth. This opening between cutter and work has a special significance and grows larger as the generating progresses. When the pressure at the trailing edge becomes high enough, a stream of metal will be extruded through the opening. Some of the damage to the cutter is caused by this. Chip-flow control will help this condition

Chip control spurs gear-shaper output

It is possible to increase tool life of gear-shaper cutters up to 400%, up production 100%, regulate and balance cutting forces, and turn out a higher-quality product. You can achieve this same performance by grinding a slight change in rake angle, thereby gaining essential chip-flow control. Sound logical? . . . Before you attempt an answer, take a quick look at these studies

J F JONES, factory engineer, THE FELLOWS GEAR SHAPER CO, SPRINGFIELD, VERMONT

Improved cutter life through control of chip flow can best be told by citing several typical case studies. Tool life of cutter for an internal-spur-gear was increased 400% by changing only the rake angle in sharpening. In this case, every effort had previously been made to get better tool life. At the time of the rake-angle change, cutting conditions were considered to be optimum. Estimated saving in this case, including reduced cutter cost and less frequent cutter change, is $60,000.

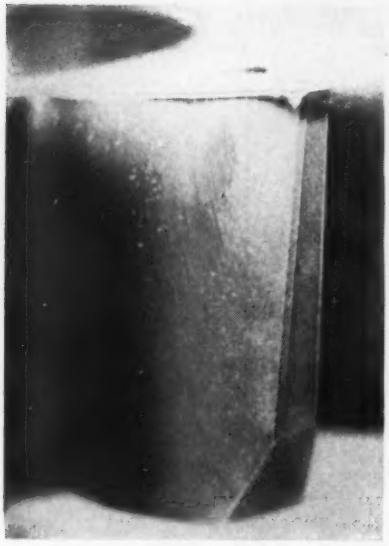
In another case, by using chipbreakers or two-step sharpening, on an external-spur-gear cutter, tool life was improved 300%.

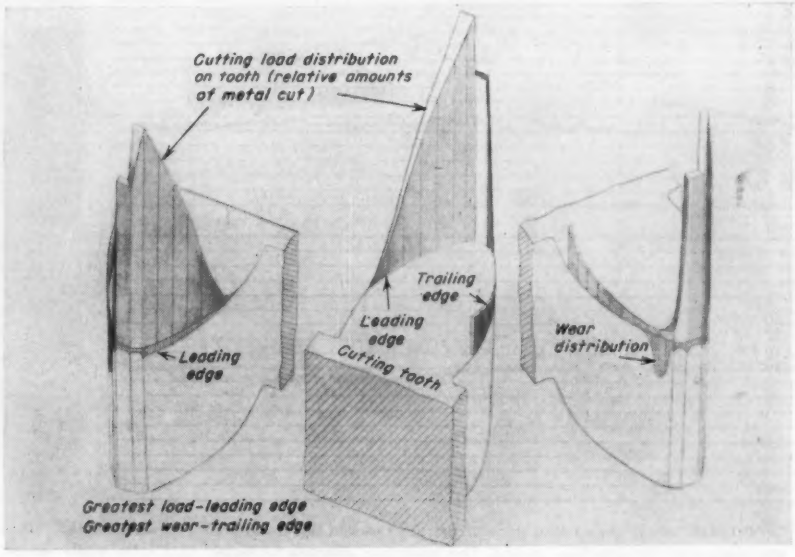
A helical pinion cutter ground for controlled chip flow performed with a combination of improved tool life, improved quality and higher production.

Another external cutter sharpened with a double rake angle resulted in 100% increase in production and 25% more tool life.

Extracted from "Increased Gear Shaper Production Through Chip Flow Control," presented at the 1954 Semi-Annual Meeting, American Gear Mfrs Assn, at the Edgewater Beach Hotel, Chicago, Oct 26.

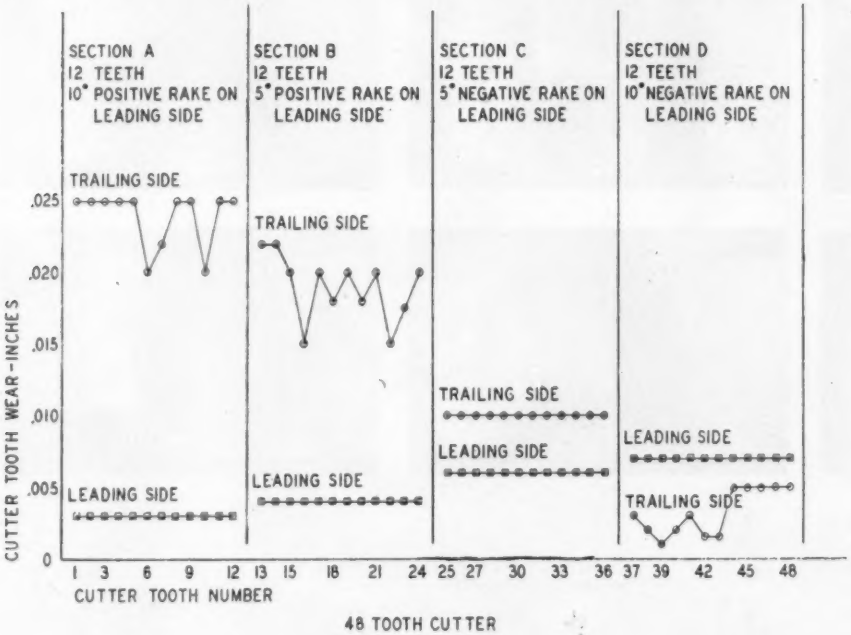
CHIP FLOW has a great effect upon cutter wear, as shown by this 15-tooth cutter which has different sharpenings on three groups of five teeth. Cutter was ground for test purposes only to note effects of sharpening and not for production. All teeth did same amount of cutting, including infeed





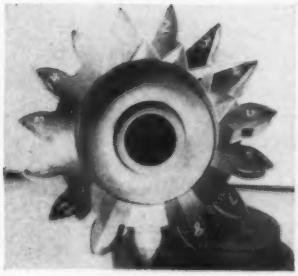
SHAPER CUTTERS used for producing spur, helical, internal or external involute spur gears will consistently show one side of each tooth has done a greater proportion of the cutting. Note the side doing heavier cutting is the leading edge. Other side doing little cutting is trailing edge, and bears an extreme concentration of wear on involute of tooth and near, but not on, the corner. This tendency increases with higher speeds and feeds demanded by modern high-production machines

Relation Between Wear Of Tooth and Rake Angle on 48-Tooth Cutter

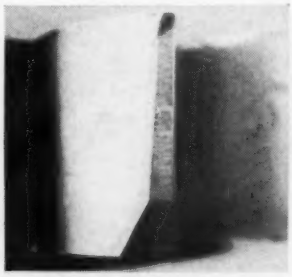


MATERIALS IN VARIOUS TESTS included B112, C1020, 3340, 4150, 5140, 1330, 1062, 94B17, 6150, and 8620. Gear blanks were cut in various stages of normalized, annealed, and quenched and drawn. Many of the microstructures included pearlite, martensite, bainite, and ferrite

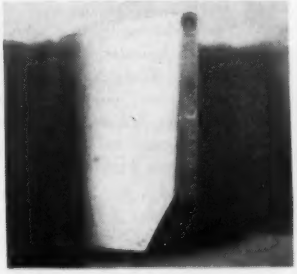
NEXT PAGE PLEASE . . .



(B) Conventional spur sharpening



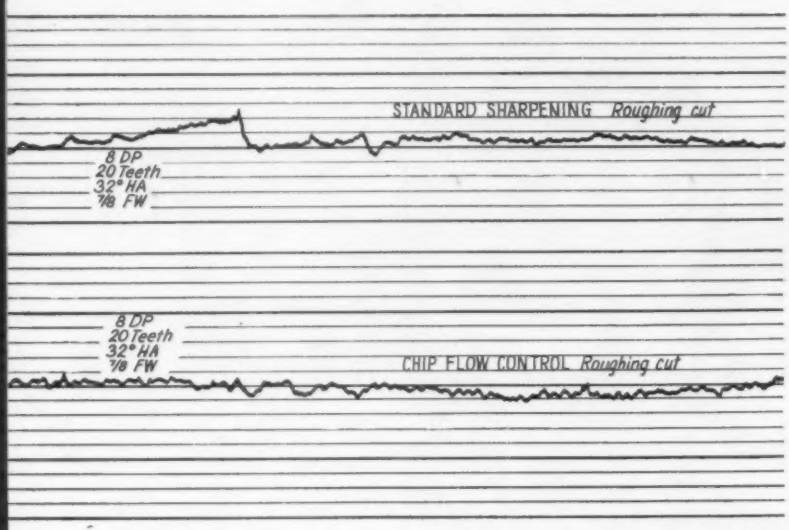
(C) Positive "V" rake—double helical sharpening on each tooth



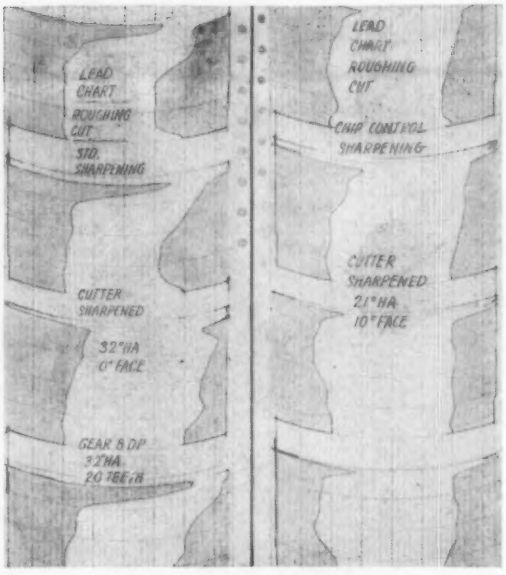
(D) Negative "V" rake

CLASSIFYING THE MANY KINDS OF CHIPS WHICH CAN OCCUR

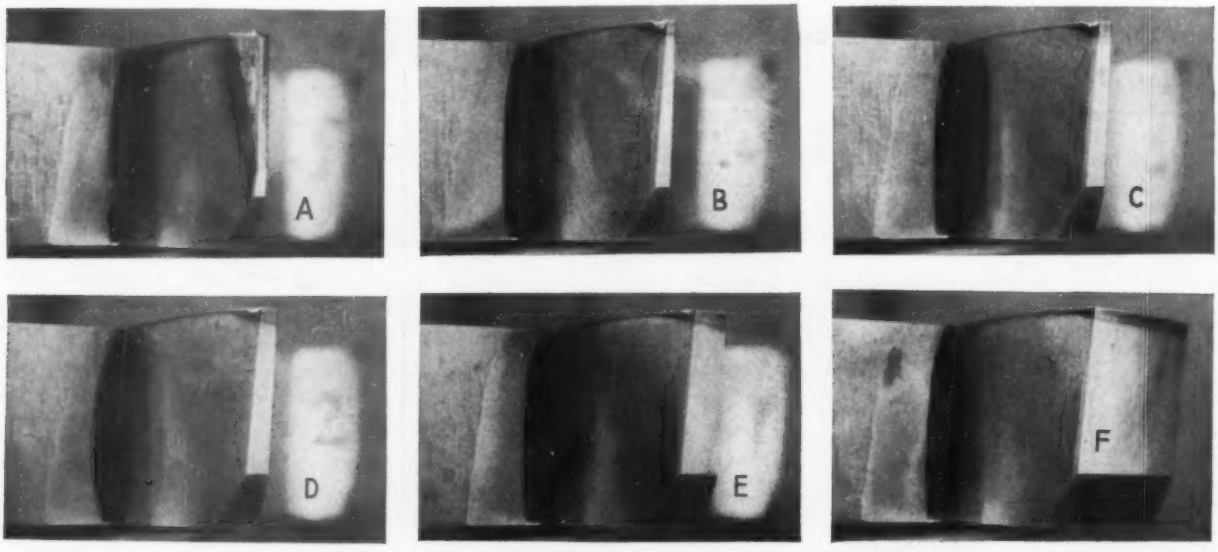
Chip control spurs gear-shaper output . . . continued



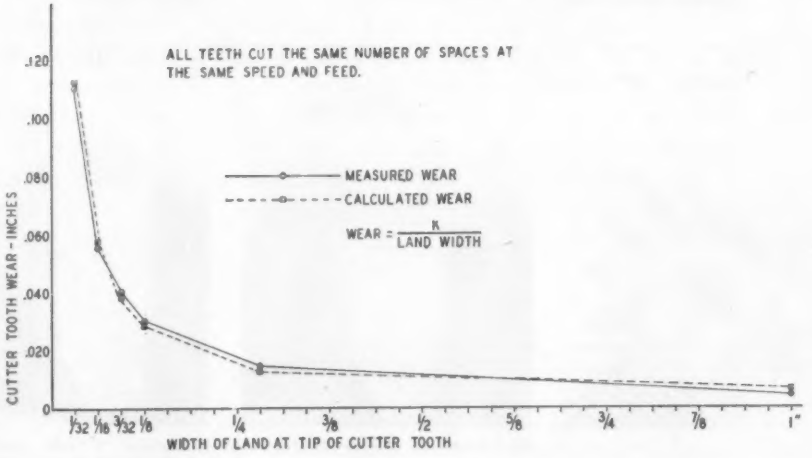
"**RED LINER**" chart shows that gear errors are reduced when cutters are sharpened for chip-flow control. This control is effective because it prevents the chip from producing excessive pressures at the trailing edge



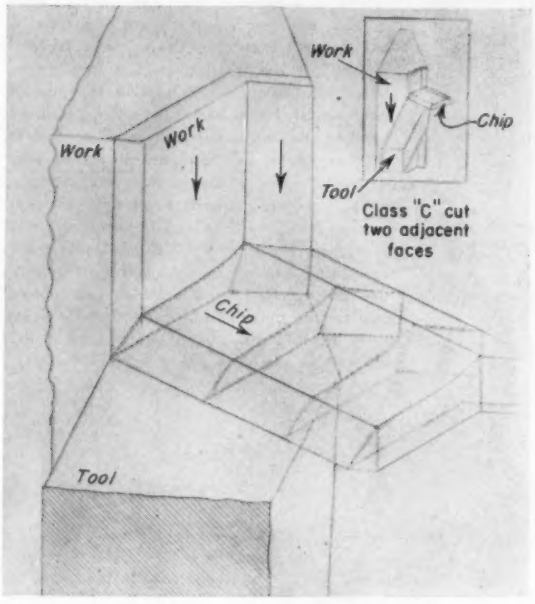
LEAD CHART shows reduction in lead error because of changed rake angle on a helical cutter. It has also been proven that the distance between leading and trailing edge has a great effect on tool wear. This wear occurs in a direct relation to amount tooth is made thin—a greater span from one side of cutter tooth to the other nullifies effects of interference



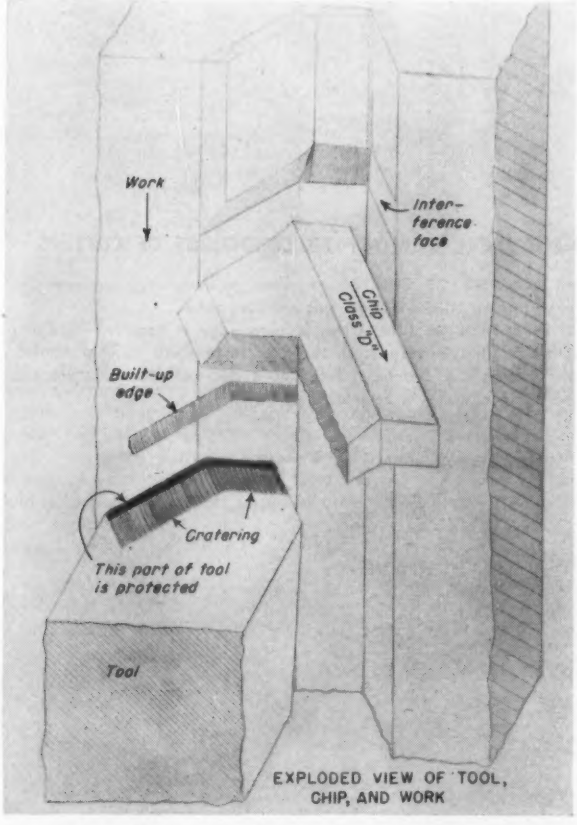
A MATHEMATICAL CONNECTION exists between tooth wear and tooth width, as shown by dotted line. The constant will vary with speed, feed, number of pieces, etc. (Photos above show the same thing pictorially). In another test, a thread-generator cutter was ground with teeth relieved alternately on opposite sides. In cutting, the relieved trailing sides become badly loaded because of chip flow from leading edge. These sides were out of contact with the work by amount of relief (0.005 in.). Subsequently, when rake angles were used to control chip flow, this loading was avoided



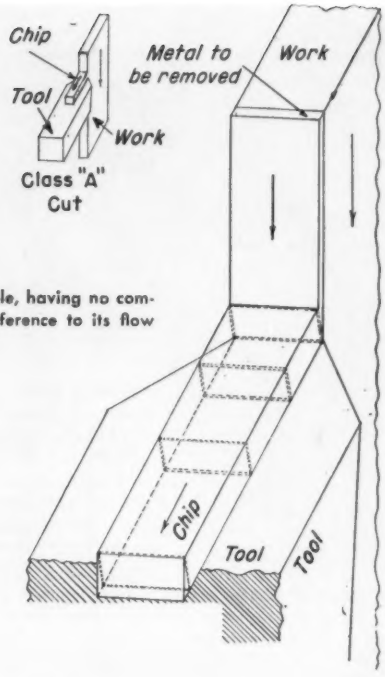
CLASSIFYING THE MANY KINDS OF CHIPS WHICH CAN OCCUR



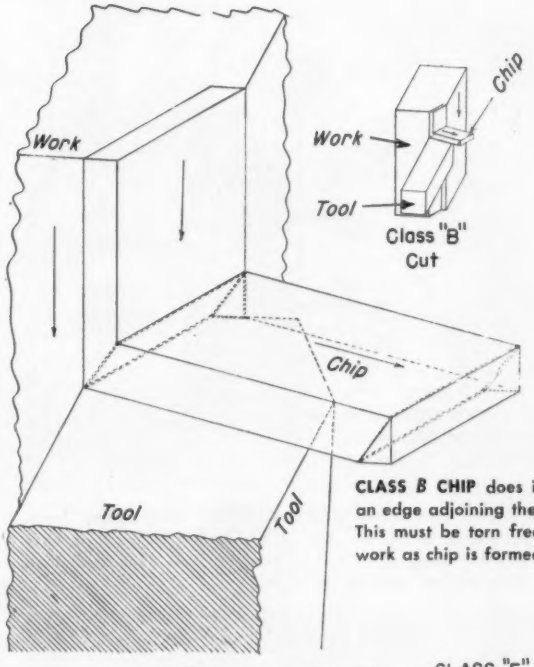
CLASS *C* CHIP has two faces but has complete freedom to flow from tool once it is formed



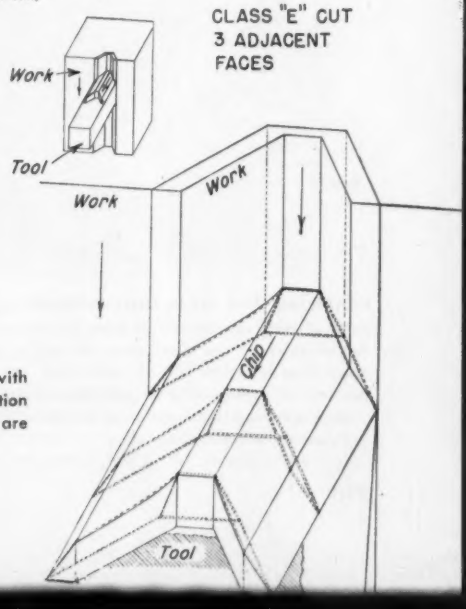
CLASS *D* CHIP has two faces and flows so that it interferes with work as it escapes from tool. ***This is the gear cutting problem.*** The buildup edge protects cutting edge of tool, while non-cutting edge has no such protection



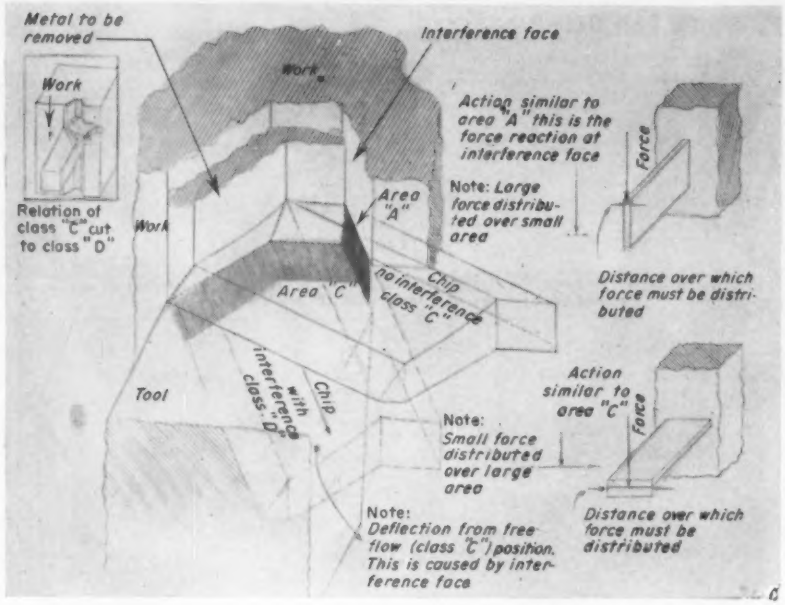
CLASS *A* CHIP is very simple, having no compounding of faces or interference to its flow



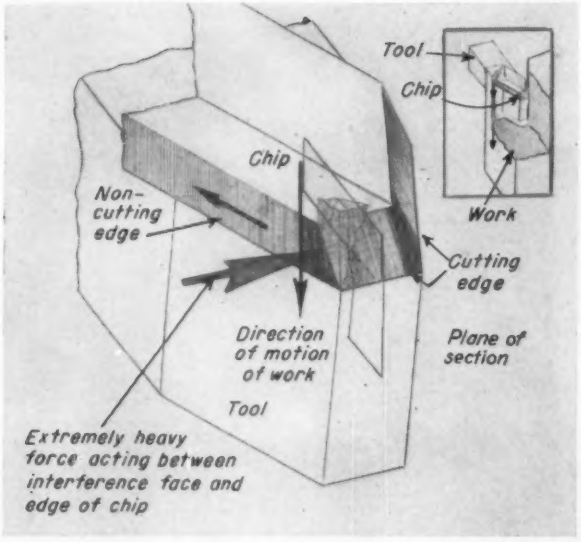
CLASS *B* CHIP does include an edge adjoining the work. This must be torn free from work as chip is formed



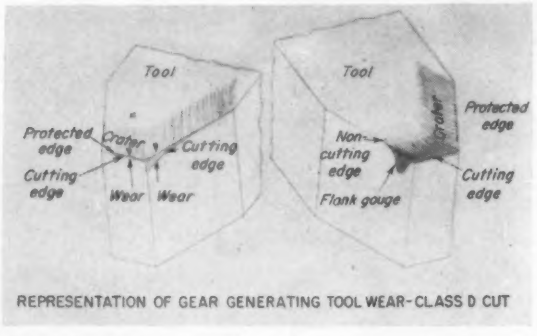
CLASS *E* CHIP has three faces. It will usually flow from tool with no interference. At time of its formation, because of interaction of the several faces, extreme pressures and temperatures are generated


Metal to be removed
Interference face
Work
Work
Relation of class "C" cut to class "D"
Action similar to area "A" this is the force reaction at interference face
Force
Note: Large force distributed over small area
Area "A"
Work
Area "C"
Chip no interference class "C"
Distance over which force must be distributed
Tool
Chip with interference class "D"
Action similar to area "C"
Force
Note: Small force distributed over large area
Note: Deflection from free flow (class "C") position. This is caused by interference face
Distance over which force must be distributed

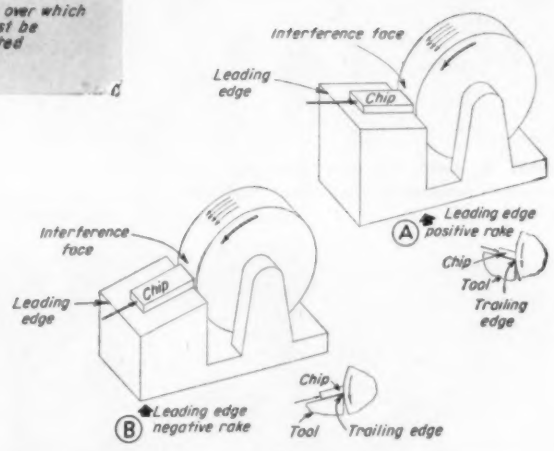
DOUBLE EXPOSURE of a class **C** cut superimposed on a class **D**. Note on class **D** cut interference between chip and work at area **A**. This condition is non-existent in a Class **C** cut. The chip formed by Class **D** must be bent through its thickest section. See analogy to beam illustration. Force applied to edge of beam must be extreme in order to cause bending, as contrasted with force applied to side of beam. This comparison shows why a terrific force exists at interference face. Because the area is quite small, unit pressures are much higher than ordinary cutting pressures, which run to 300,000 psi. Under these conditions it is to be expected that quantities of strain-hardened particles are rubbed against the non-cutting edge. High temperatures in this area have been detected by the aid of semi-high-speed movies



TOOL WITH A CHIP AND WORK REMOVED. Note heavy force, shown by arrow, acting on chip at non-cutting edge. It is easy to see why hardened particles and heat are first generated, then drawn from chip to tool by the work

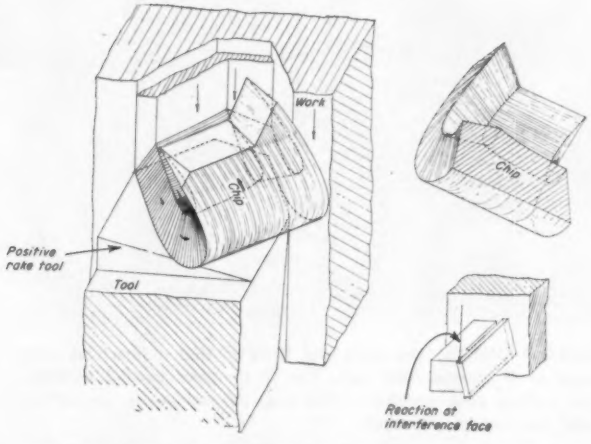


CRATERING AND WEAR DISTRIBUTIONS on cutting and non-cutting sides of teeth can readily be seen on almost any gear-shaper cutter. An analysis of the distribution of cutting load shows non-cutting edge does less than 5% of total work. The tip does greatest work per unit of cutting edge length. Wear distribution is just the reverse —least wear on tip, next in line comes leading edge, and finally greatest wear on trailing edge

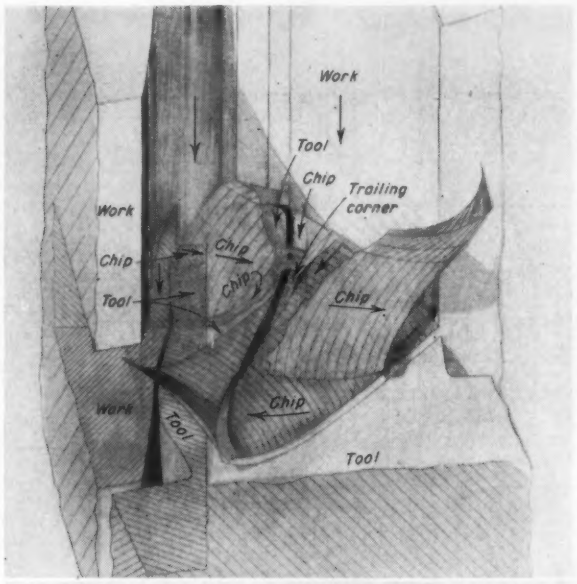


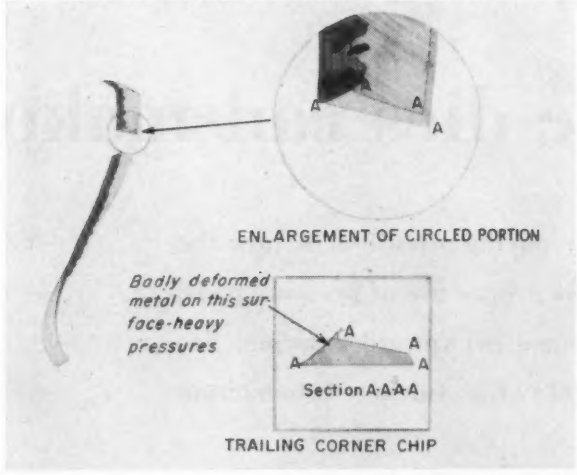
MECHANICAL ANALOGY TO CONDITIONS OF CUTTING

(A) **WEDGING OF CHIP** occurs when leading edge has positive rake—trailing edge therefore has negative rake
(B) **DIRECTION OF CHIP** when leading edge is negative—wedging action of chip is very much reduced. If pressure of chip against interference face can be reduced or if chip can be made weaker, damaging effects will be minimized

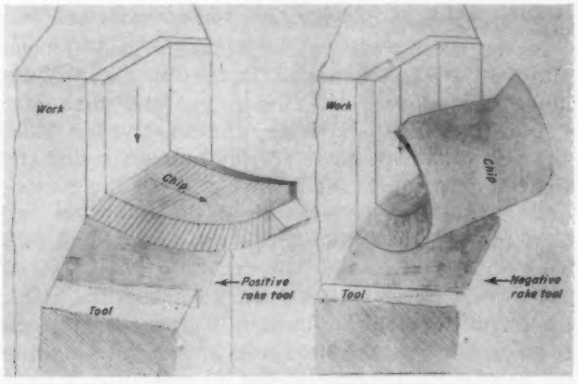


HERE CHIP DOES NOT TEND TO CURL AWAY from interference face, and reaction is analogous to beam and support. Load applied to edge of beam forces it against support. Greater resistance to deflection is the result

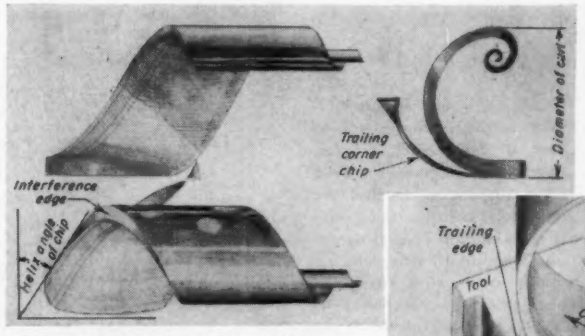


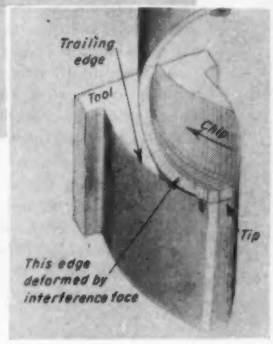


HERE ARE THREE CHIPS, a major chip, a small trailing-corner chip flowing under major chip, and a larger trailing-edge chip. Note trailing-corner chip which is formed under conditions of extreme pressure. Enlargement of trailing-corner chip shows badly deformed surface of one portion. This results from extreme pressure which major chip exerts on trailing-corner chip. If a gap exists at this point, a small flow of metal will occur down side of cutter tooth. Result will be damage or loading of the involute profile. Here's how chip-flow control will remedy this condition . . .

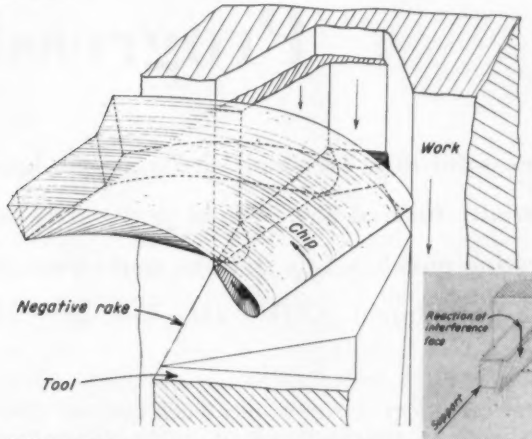


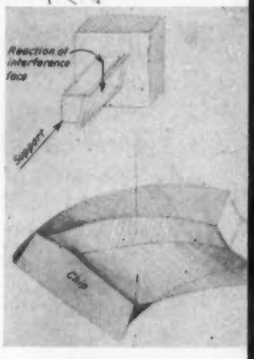
POSITIVE RAKE AND NEGATIVE RAKE TOOL taking a class C cut—two-sided chip with no interference. Direction of chip flow changes depending upon which type of rake is used. Normally negative rakes are undesirable in metal cutting but the advantages can be readily appreciated by a desirable chip flow



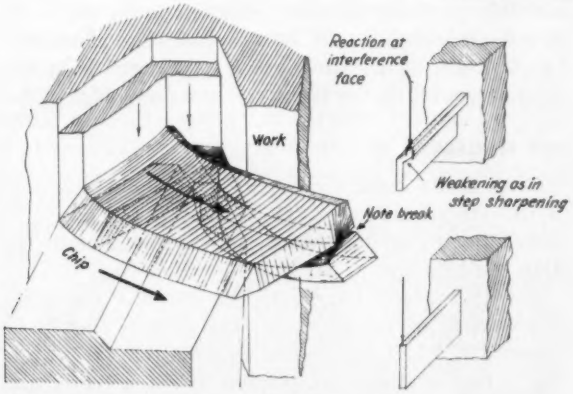


CHIP PRODUCED BY A GEAR SHAPER has several interesting characteristics; namely the diameter and trailing-corner chip. Most significant is the fact that the chip is much like a helix. Normally when a chip is formed by a cutting tool a simple spiral results as the chip curls about an axis parallel with cutting edge. The elements tend to remain in planes perpendicular to this axis. In the chip shown, force of the interference face acting on the edge has produced a "helical spiral." Helix angle of the chip is an indication of amount of deformation caused by interference face. The higher the helix angle, the greater has been the force



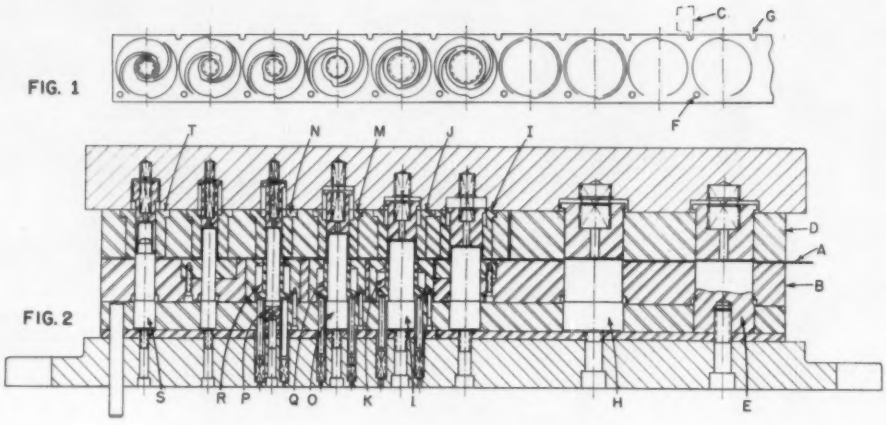


CURLED CHIP from a tool having negative rake on cutting side. Chip is being curled rapidly away from interference face, thereby reducing pressure. Force between interference face and chip is analogous to beam illustration—load on beam lifts it from its support



WEAKENED CHIP produced by a tool which has step sharpening. Cutting edge is higher than non-cutting edge. Offset permits easier bending of chip—chip will bend and break as shown. In tests of this sharpening a tool life improvement of 300% over standard was found

FIG. 1 . . . Slit fingers normally surround the metal to draw a deep shell progressively. These fingers act like a spring suspension so that the work can adjust itself vertically during the several operations without distorting the remainder of the strip. Fig. 2 . . . Four stations ar used to cut the slit fingers and push the blank back into the strip. At the fifth station, cupping takes place in die *I*. Spring-backed ejectors at each station eject the shell and prevent the strip from rising with the punch



Cope Talks on Draw Dies...XXIII

Progressive dies can make

Successful dies for small shells are designed by paying attention to how the partially formed part is held in the strip, and the proper use of pressure pads, locating punches, idle stations, and either downward or upward drawing. See also Installment XXII (*AM*—Dec 20 '54, p94) for further information

Three conditions should be met when drawing deep shells in a progressive die. First, the metal must be allowed to flow without stretching. Second, there should be no interference to the drawing operation from restraint by the scrap strip. Third, the lead, or spacing of stations, should be uniform throughout the die.

These conditions are met by carrying the blank and the partially formed work along in the strip by a flexible suspension. Two methods are available: (1) the use of slit fingers, or (2) cutouts in the strip surrounding the blank so far as possible.

SLIT FINGERS

Deep shells made from thin stock should be held in the strip by fingers. These permit the shells to move upward or downward, and the balance of the strip remains flat.

Slit fingers will vary with the shape of the shell. In the case of round shells, the fingers should be concentric, Fig 1. As shown in this illustration and Fig 2, four stations are needed to slit a blank and provide fingers to hold it in the strip, while the shell is being drawn and redrawn to the desired diameter. In the first station the outer side of the left-hand finger and the inner side of the right-hand finger are cut. The two cuts are joined by a 60° angular cut which starts at the vertical centerline of the blank, as shown in Fig 1. The left-hand finger is slit to within 30° of the centerline, and the right-hand finger is slit to within 15° of the centerline.

PUSHED BACK IN STRIP

In the second station the blank is pushed back into the strip and flattened. In the third station the inner side of the left-hand finger and the outer side of the right-hand finger are cut. The left-hand finger is slit to within 15° of the centerline, and the right-hand finger is slit to within 30° of the centerline.

In the fourth station the blank is again pushed back into the strip and flattened.

To avoid burrs it is necessary to push the blank back into the strip and flatten it after the first cut, to be certain that the strip rests flat on the die while the second cut is being made. When both cuts have been made, it is necessary to push the blank back into the strip again, and then to flatten the strip, to permit the blank to be gripped tightly between the drawing die and the pressure pad.

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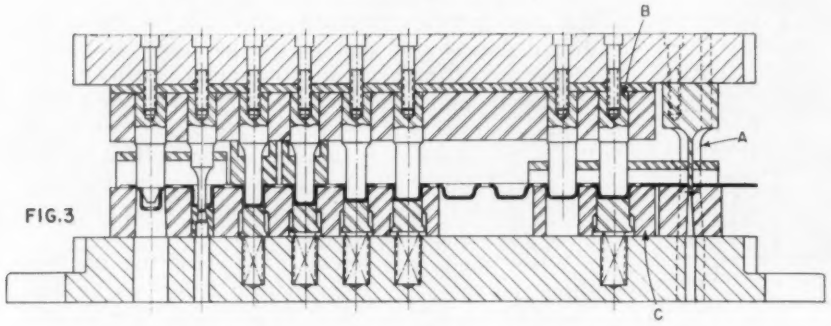


FIG.3

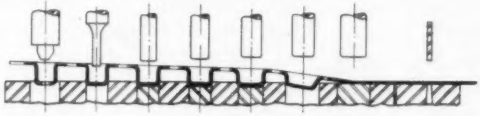


FIG.4

FIG 3 . . . Station 3 is an idler, or "dummy", station, where the punch and die merely locate the shell in the strip. This usage of a punch as a locater is effective when the metal is comparatively thick with respect to the shell diameter. **Fig 4 . . .** Plenty of idle space is necessary after the locating station, Fig 3, to avoid kinking the strip and tilting the shell

deep shells

STANLEY R COPE, president,
ACME SCHOOL OF DIE DESIGN ENGINEERING,
SOUTH BEND 1, IND

APPLICATION OF SLIT FINGERS

A typical die that holds shells in the strip with fingers is shown in Fig 2. In operation, strip *A* is laid on pressure pad *B* and is pushed across the die until it strikes side-acting automatic stop *C*, Fig 1. The press in then tripped and upper die *D* grips the strip against pad *B* and forces both the strip and the pad downward. Near the end of the stroke, punch *E* slits the blank, punch *F* (Fig 1) pierces a pilot hole, and punch *G* (Fig 1) notches the strip for gaging purposes.

The strip is then advanced to the second station of the die where the blank is pushed back into the strip and flattened. In the third station punch *H* completes the slitting operation, and in the fourth station the blank is again pushed back into the strip and is flattened. In the fifth station the blank is gripped between die *I* and pad *B* and is drawn into a cup. In the sixth station die *J* contacts the bottom of the first-operation shell and pushes it downward over draw collar *K*. The fingers which connect the shell with the strip permit the shell to be pushed downward over the draw collar until die *I* can contact the flat strip.

Continued descent of the slide forces the draw collar downward and the shell is reduced in diameter by punch *L*. The shell is further reduced in diameter by dies *M* and *N* and punches *O* and *P*, and by draw collars *Q* and *R* in the seventh and eighth stations. In the ninth station the shell is sized and the bottom and drawing radii are set. In the tenth and last station, the completed shell is blanked from the strip by punch *S* and die *T*. Spring-backed ejectors are provided in each station of the die to eject the shell and to prevent the strip from rising with the punch.

CUTOUTS IN STRIP

The choice of fingers or cutouts depends upon the thickness of stock and the diameter and depth of the shell. Small shells made from comparatively thick stock, and not drawn too deep, can be drawn and redrawn successfully by cutting out the metal blanks. Refer to Installment XXII for examples. When sections are cut out between blanks, the cuts should extend around the blanks as far as possible, leaving only a small portion of the blank connected to the strip on either side.

When a section is cut out between blanks, and the shells are held in the strip by rails, the shells are not free to move upward or downward without disturbing other parts of the strip. Consequently, the strip often becomes twisted and distorted, and the shells lean at different angles—they assume various positions as they pass through the die. Moreover, when a pressure pad is used to draw the first shell (which is usually the case), the shells must actually reduce in diameter by being forced into a

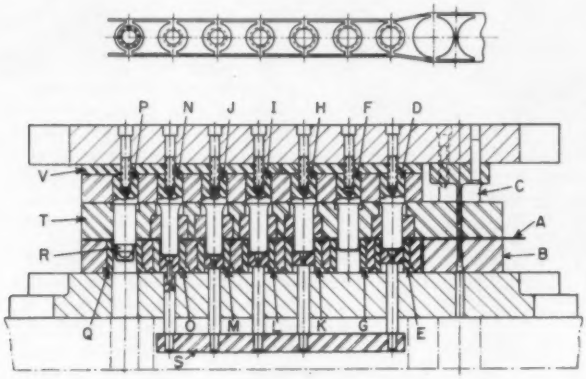


FIG 5 . . . When shells are drawn downward, as by punches on the upper die member, the finished shell and slugs can be ejected through holes in the die and bolster, but the strip may have to be lifted at each advance

hole without the aid of a punch. The punches do not enter the shells until the pressure pad starts to recede.

There are three ways of drawing and redrawing shells in the strip when sections have been cut out between the blanks. If the metal is very thick in relation to the shell diameter, a die similar to that shown in Fig 3 can be employed. No pressure pad is used. The heavy stock is relied upon to resist wrinkling when the flat blank is being drawn into the first-operation shell.

In operation of the die, a section is cut out between the blanks by punch *A*, after which the strip is advanced to the second station. At this station, the blank is drawn into the first-operation shell by punch *B* and die *C*. The third station is an idler or a "dummy" station, used to locate the shells accurately in the strip. The punch and die of this station are identical to those of the drawing station. This is a very effective method of locating shells in the strip and should be used wherever possible.

Nothing occurs in the fourth and fifth stations. These stations are left idle to permit the strip to bend on an angle for a considerable distance between the reducing and drawing stations. If sufficient space is not provided between these stations, the strip may kink badly and tilt the shell before it can be reduced, as shown in Fig 4. Tilting of the shells and bending of the strip must be avoided as much as possible.

The shell is reduced in diameter and increased in length in the sixth, seventh, eighth and ninth stations, Fig 3. These operations are accomplished simply by forcing the sells into dies of smaller diameters. In the tenth station, a hole is pierced in the bottom of the shell, and in the eleventh and last station the shell is blanked from the strip. The strip is prevented from rising with the punches by solid strippers.

When the shell is too large, or the metal is too thin to be drawn without hold-down pressure, the die should be provided with a pressure pad, as shown in Fig 5 or Fig 6. These two dies produce identical stampings. Working details of both dies are similar but they operate differently. In Fig 5, the shells are drawn downward; that is, the pressure is applied to the top of the strip and the metal is drawn into the dies by punches which are fastened on the punch holder and descend with the slide of the press. In Fig 6, the pressure is applied to the bottom of the strip, and the shells are drawn over the punches which are fastened on the die holder. Both methods have good and bad points.

When shells are drawn downward the finished shell and the slugs from pierced holes can be disposed of beneath the press by allowing them to pass through the die and a suitable hole provided in the bolster plate. When the punches are fastened on the die holder, and the metal is drawn over them, the finished shell and slugs must be ejected from the upper die or disposed of through escape ports. Consequently, the press must run slower and fewer pieces are produced per hour. If the finished shell is ejected and allowed to fall back on the die, either the press must be inclined or provision must be made to move the shells out of the way.

The advantage of drawing shells over the punches lies in the ease with which the strip can be fed across the die. The bottom of the strip slides across the flat pressure pad and is not obstructed in its travel by holes or other obstacles. Moreover, the strip rests flat on the pressure pad and the shells remain in a vertical position ready to enter their respective die holes.

INTERFERENCE WITH STRIP FEEDING

When shells are drawn downward, the strip must ride on the bottoms of the shells when it is pushed across the die. Since the shells are of different heights, and the holes in the die often interfere with the passage of the strip, it may be necessary to lift the strip each time it is advanced. A further difficulty is that the strip does not lie flat on the die and the shells do not assume vertical positions. The pressure pad must be relied upon to make the shells stand up straight before they enter the die in which they are reduced.

The operation of the die shown in Fig 5 is: Strip *A* is pushed across the die until it covers the die opening in die block *B*. The press is then tripped and punch *C* pierces a hole in the strip. The strip is then removed from the die and the excess metal (half of one blank) is cut from the end of the strip. The strip is then placed back in the die. When the press is tripped for the second time, punch *C* cuts out a section between the first and second blanks. The strip is then advanced to the second station and the first-operation shell is drawn by punch *D* and die *E*. Punch *F* and die *G* of the third station are locators and serve to accurately space the shells in the strip. In the fourth, fifth and sixth stations the diameter of the shell is reduced and the shell is increased in length. The reducing punches are shown at *H, I* and *J;* the reducing dies at *K, L* and *M*. In the seventh station the shell is sized, and the drawing and bottom radii are set by punch *N* and die *O*. In the eighth, or last, station the shell is blanked

from the strip by punch *P* and die *Q*. Before this blanking operation, the pilot *R* enters the shell so that the flanges will be concentric with the body.

Ejectors are provided in each station to raise the strip to the die surface after each press stroke. These ejectors are mounted on plate *S* which is actuated by a pull-up attachment. An ordinary pressure attachment cannot be used, because the ejectors must drop down out of the way when the press is tripped.

Spring stripper *T* bottoms on the punch plate at the end of each stroke to flatten the flanges of the shells and keep the strip straight. Hardened inserts are provided in the stripper so that it will not be damaged. A hardened plate is provided at *V* to prevent the punches from sinking into the punch holder.

In contrast the die shown in Fig 6 works in this fashion: Strip *A* is placed on pressure pad *B* and is pushed across the die until it covers die block *C*. The press is then tripped and punch *D* pierces a hole in the strip. The excess metal is cut from the end of the strip, the strip is advanced and the press is tripped for the second time to cut a section from between the first and the second blanks. The strip is then advanced to the second station and the first-operation shell is drawn by punch *E* and die *F*. Punch *G* and die *H* of the third station are locators and serve to accurately space the shells in the strip. In the fourth, fifth and sixth stations the diameter of the shell is reduced and the shell is increased in length. The reducing punches are shown at *I*, *J* and *K*; the reducing dies at *L*, *M* and *N*. In the seventh station the shell is sized and the drawing and bottom radii are set by punch *O* and die *P*. In the eighth, or last, station the shell is blanked from the strip by punch *Q* and die *R*. Pilot *S* insures that the flange of the shell will be cut concentric with the body.

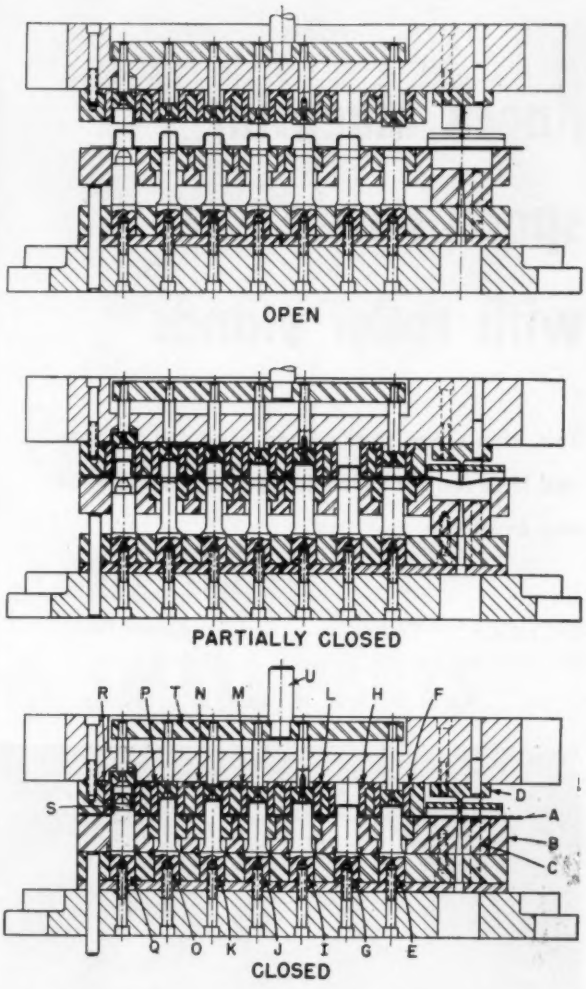


FIG 6 . . . Same job as in Fig 5 is handled by drawing shells by punches located in the lower member. The method avoids obstruction of strip advance, but is slower because the finished shell and slugs must be ejected from the upper member

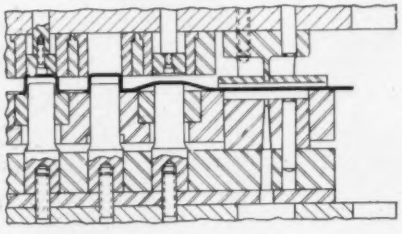


FIG 7 . . . If the pressure pad is not backed up with enough pressure, the blank will not be properly confined at the first operation

KNOCKOUT-BAR ADJUSTMENT

The shells are ejected in each station of the die by pins which are attached to plate *T*. Plate *T* is actuated by knockout rod *U*. The knockout bar in the press must be carefully adjusted to eject the shells shortly after pressure pad *B* has returned to its top position. Otherwise, the strip will be raised too far off the pad and may be distorted.

When shells are produced progressively in dies similar to those shown in Fig 5 and Fig 6, the reduction in the diameters of the shells in each station of the die should be considerably less than that which would be used if the shells were made in separate dies. For example, if it is standard practice to reduce the shell 20% in each operation when separate dies are employed, the same shell should only be reduced 15% in each station of a progressive die.

The reason for this decrease is apparent in the open view and in the partially closed view of die shown in Fig 6. In the partially closed view, all the reducing operations are shown completed before the pressure pad starts to descend, and without any of the punches entering the shells. The shells are actually reduced "on air" so far as the punches are concerned. The pressure pad must be backed by sufficient pressure to prevent its descent until after the shells have been reduced. Otherwise the blank will not be confined between the die and pressure pad when the first operation shell is drawn, Fig 7.

When the pressure pad is forced down, the reducing punches enter the shells to size them and give them a more accurate shape. If the successive reductions in the diameter of the shell are too great, or the shells are high in relation to their diameter, they may tilt and collapse.

Part XXIV of Mr. Cope's series will appear in an early number.

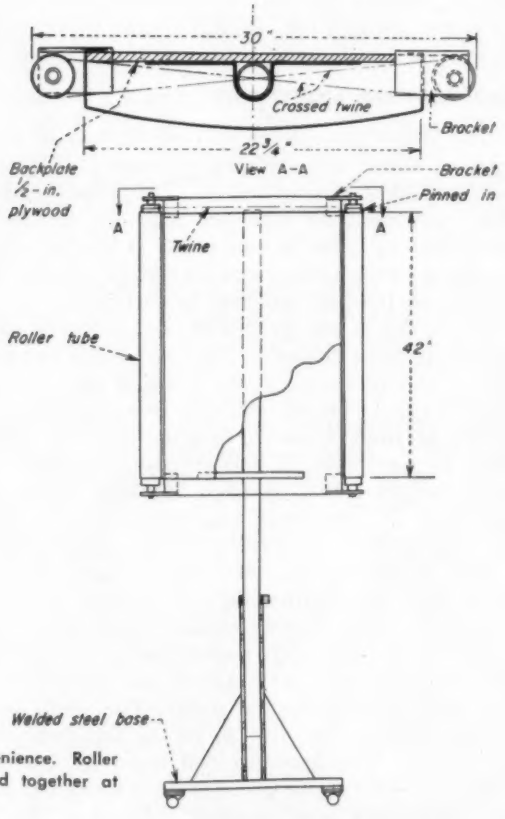
Knock blueprint space waste with roller stands

This idea's one that's been used for maps—and it saves space while keeping prints neat and available

NICHOLAS INSANA, asst to mgr, Experimental Dept,
BELL AIRCRAFT CORP, NIAGARA FALLS, N Y

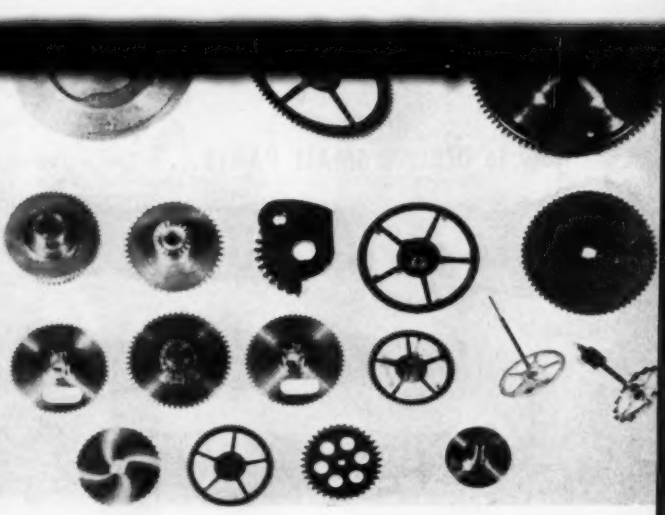
JIG-BORER OPERATOR CHECKS PRINT mounted on roller stand in Bell toolroom. Assembly and production-machine areas also utilize stands. Prints up to 12 ft long and 42 in. wide can be handled; they are mounted on aluminum rollers with strippable tape, and rest against curved aluminum platen

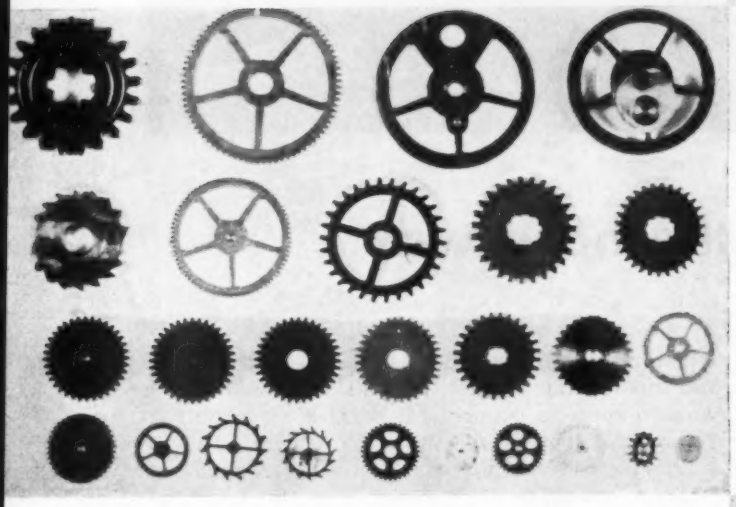
STANDS CAN BE MOUNTED HORIZONTALLY, tilted for easy reading, on simple wood bases. Waxed cord looped around both rollers is usually crossed to resist print unrolling. Rollers have 2¾-in. dia, are 42 in. long, and are fitted with wooden end plugs and steel spindles that fit brackets bolted to plywood back plate



WELDED BASE ALLOWS VERTICAL ADJUSTMENT for convenience. Roller tube, wood plug, and cold-rolled-steel spindle are pinned together at each roller end

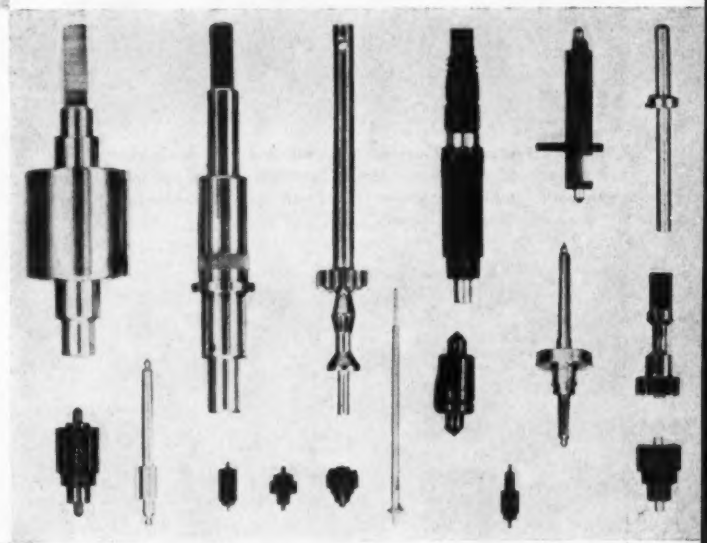
American Machinist
SPECIAL REPORT
NUMBER 383

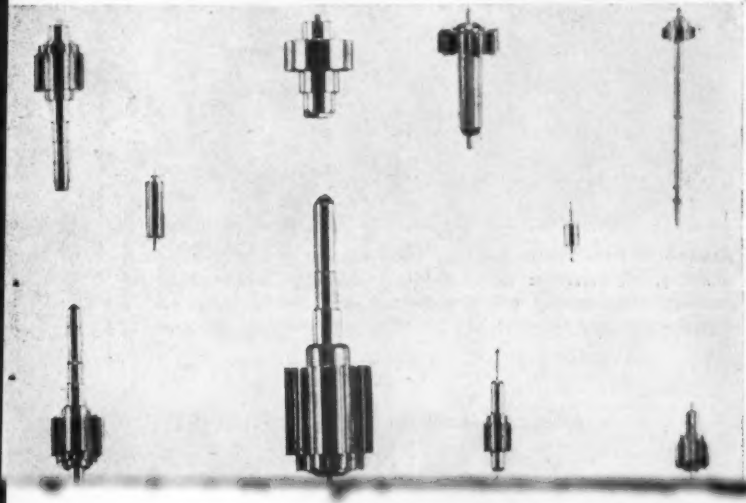




How to DEBURR SMALL PARTS

Watch, instrument and fuse parts are classed as "miniatures" in Metalworking. Obviously they must be well finished — free of burrs, attached chips and tool marks. Traditionally, women with loupe in eye scraped burrs and sharp edges with a scalpel. Tumbling procedures had been used prior to 1950, but results were not uniform. In that year, a development program was started in our laboratories to find the best methods and equipment for deburring and burnishing small parts, regardless of metal, shape, smallness of holes, depth of recesses and fragility. Answers to these problems have already saved hundreds of thousands of dollars in processing costs. In addition, time for processing is reduced and quality improved.





H L HOVIS, superintendent of metals processing
HAMILTON WATCH CO, LANCASTER, PA

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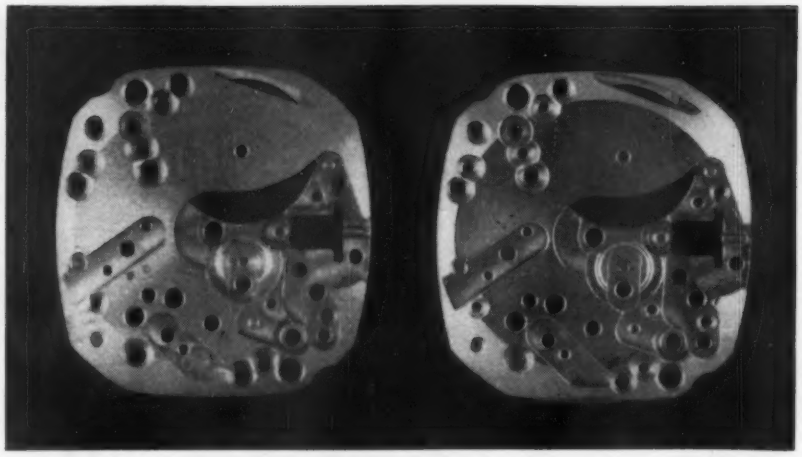
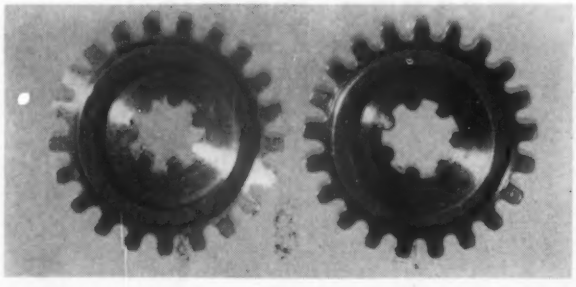
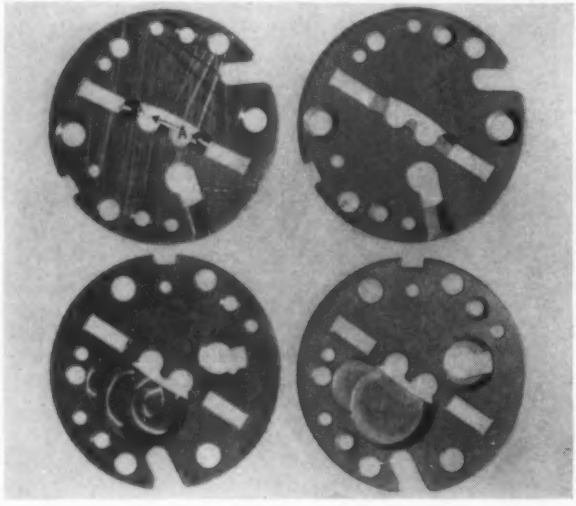


PILLAR PLATES have numerous burrs after machining. One burr in the train recess was inaccessible to hand scraping. Production tumbling for 3 hr in a rubber-lined barrel with 1/16-in. double-pointed steel pins and burnishing soap removed all burrs and made the surfaces more lustrous. Left—part after machining. Right—plate after tumbling

We learned to tumble the hard way



BURRS on the internal splines of small brass watch pinion (left) are difficult to remove by hand. Tumbling cleans up spline and gear-tooth profiles, improves the finish and appearance of the part. Enlargement 2½ times



BRASS FUSE PLATE (both sides). Upper left—Chip *A* is attached to side of deep recess. Lower left—tool marks are evident in bottom of recess. All edges of holes and recesses are sharp. Right-hand views show proper rounding of edges and all burrs removed. Matte surface is satisfactory for fuse parts, not permissible for watch components

Small precision parts, such as those used in watches and instruments, are not the kind of items that you would expect to deburr and burnish by tumbling. The operation would seem to be too violent for small fragile pieces containing many small holes and deep recesses, and made to close tolerances. We had tried the process, of course, and were using it prior to 1950 on a few items with not very consistent results. Most of our finishing operations—and there are many of them—were still done by hand.

Economic necessity forced us to investigate tumbling on a scientific basis with a view to adapting or developing it for our class of work. The four objectives of a production-research program were:

1. To study existing methods in the factory and establish control specifications for them.

2. To study the process to see if it could be broadly applied as a supplement to or substitute for hand deburring, brushing and stoning, and for acidizing.

3. To study the materials used in tumbling in order to determine abrasives, slugs and solutions most suitable for development of satisfactory finishes on

ALUMINUM FUSE PLATE (left) has large burrs at *A* and *B*. After tumbling, all burrs are removed (right), the edges are suitably rounded and scratches on work surfaces are virtually removed Both the brass and aluminum fuse plates are shown slightly enlarged

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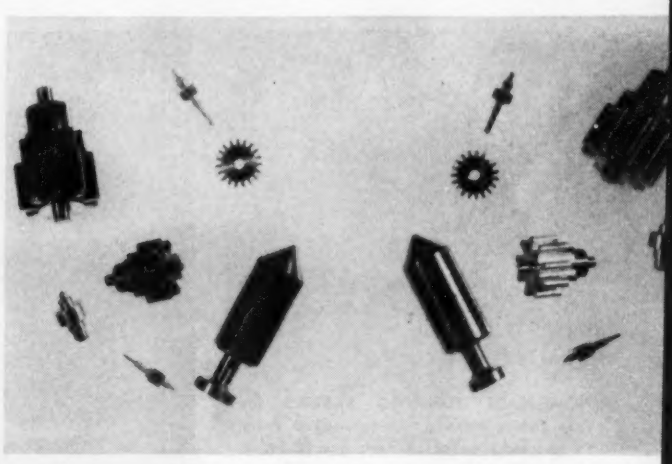
CHIPS REMOVED from 1200 pillar plates, proving that burrs are removed and corners are properly rounded, even though some defects are difficult to see with the eye



STEEL WATCH PARTS (shown greatly enlarged) have burrs removed from surfaces, holes and between teeth, and the over-all finish is greatly improved. Left—before tumbling. Right—after tumbling. Only the eye, not the camera, can distinguish the improvement, because of the smallness of the pieces

watch, instrument and government-contract parts.

4. To examine existing tumbling equipment and determine necessary modifications or new designs suitable for our work.

This project was far from simple, considering not only the work characteristics but also the metals we use. Our parts, functional and decorative, cover a wide range of metals—steels, stainless steel, aluminum, brass, bronze, beryllium copper, nickel silver, sterling silver and gold. These materials are often machined to very small parts having many drilled holes, recesses, threads and sharp edges. Close tolerances must be maintained. Desired finishes range from a line-finish pattern to a highly burnished or polished surface.

Since October, 1950, we have evaluated more than 250 materials as tumbling agents. These include loose and bonded abrasives, metal chips, slugs, shot, pins, rubber products, rayon flock, sand, garnet, ground fruit pits, nut shells, corn cobs and oyster shells, sawdust and others. Chemical compounds in great variety, soaps, detergents, plus wetting agents and rust-preventing materials, have been studied.

In tumbling, where a burr-removal problem is present, one must use some form of shot and an abrasive. For a purely burnishing operation, one can often produce the desired finish by the action of shot alone. But in either operation, the application of metallurgy, chemistry and physics are important during both the tumbling operation and the cleaning steps that follow. Barrel speed, size of barrel, kind of lining and size of charge with respect to barrel size are important. But the solution is important too. It must have a certain degree of chemical attack on the work, it must prevent formation of adherent sludges on the work, it must have certain flotation properties in combination with any abrasive used. A soapy solution may be necessary for one job, an alcohol for another.

PLATE FOR WOMAN'S WATCH and assembly of a brass plate with internally serrated hole to a serrated section of a shaft. Deep recesses in the plate can be burnished by tumbling. Assembly of the plate to shaft is facilitated by removing burrs from the mating serrations. Enlargement 2 times

In the first stages of our work, more than 1300 tests were made, and from these we wrote 65 process specifications. After review, these were reduced to 13 basic specifications. These call for only about 15 tumbling materials—slugs, abrasive and solutions. All process sheets for parts approved for tumbling bear code numbers for the correct procedure and tumbling materials. These are listed on operation sheets.

Cost Savings. Thus far, our savings by substitution of tumbling procedures for hand work have already run into hundreds of thousands of dollars. Some examples are:

18K DIAL MARKER DOTS. Small conical dots are used in place of numerals on dials. Handling of these minute pieces while mounting for finishing (the foot of the parts being pressed into a linoleum disk) was excesssive, and it was difficult to get a uniform contour and finish. By tumbling, 10,000 pieces are produced in one load to higher quality standards. The same number of pieces processed by hand would require 200 manhours per week for four months.

FUSE PLATES. These were deburred by a vendor for $5.50 per 1000 pieces. Our tumbling cost is $1.33.

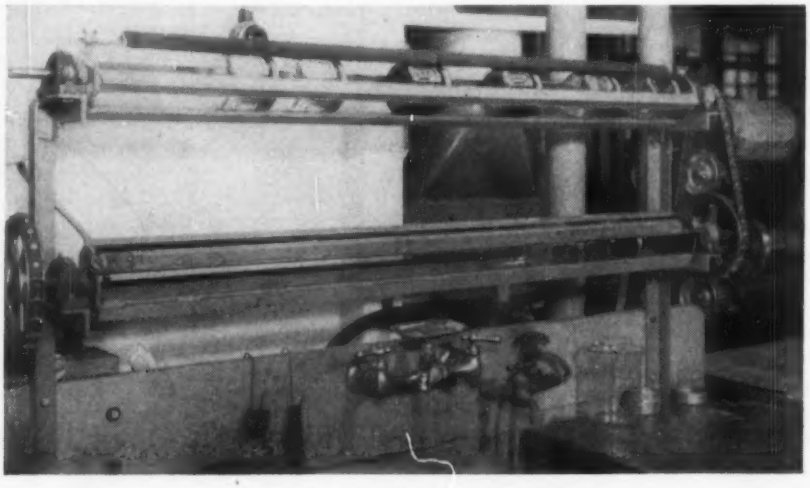
HOME-MADE TUMBLING BARRELS for fuse plates have a variable-speed drive to suit work needs. Barrels are 20 in. in dia by 32 in. long. Twenty-one different plates are tumbled satisfactorily to three basic control specifications, although 43 media were tested. It is estimated that savings by tumbling fuse plates will reach $500,000 by the end of existing contracts

Equipment used for tumbling

Except for fuse plates, we found that no tumbling equipment on the market was suitable for our class of work. We need small containers because a load of very small screws, for example, may be only a 2-oz volume, and it contains thousands of pieces. So we use barrels ranging in size from 8-oz glass jars to horizontal barrels measuring 20 x 32 in. The last, for fuse plates, were built by our maintenance department to our specifications. Glass jars are gripped in a quick-loading, power-driven reel; stainless steel, free-rolling barrels are laid upon power-driven rolls and driven by friction. Our objective was to obtain quick loading and unloading, keep the equipment and barrels simple, and minimize the number of drives.

Friction-Driven Barrels. Because of the small size of watch and instrument parts, a barrel load containing thousands of pieces may weigh only a few pounds. This has made it necessary to devise suitable tumbling equipment.

Hamilton engineers built machines consisting of two pairs of power-driven rolls mounted horizontally in a metal frame. The two pairs of rolls are driven at different speeds, by a suitable arrangement of belts and pulleys. Therefore, the operator has a choice of two speeds. He places a barrel—or several of them in a row—upon the rolls at the speed called for in the process specifications, and allows the barrels to remain for the predetermined time. Rolls are covered with rubber hose to serve as a friction surface and to provide wear resistance. Part number and tumbling time are marked directly on the barrel exterior with red grease pencil, so that the operator knows when a particular load is com-



"BARBASOL JAR" tumbling machine is suitable for many small pinions and shafts, where many thousands often fill only a cup. One bar in each reel is held by wing nuts, so that the 8-oz jars can be quickly loaded and unloaded. Sometimes, jars are loaded crosswise to get an end-over-end tumbling action

PROPER CLEANING of fuse plates in hot and cold rinses, a soap cleaner with wetting agent added, rinsing, and centrifugal drying with hot air blast removes all traces of sludge and avoids stains on the work. Steel plates are given an alcohol rinse after the last water rinse to remove any droplets that would cause rusting

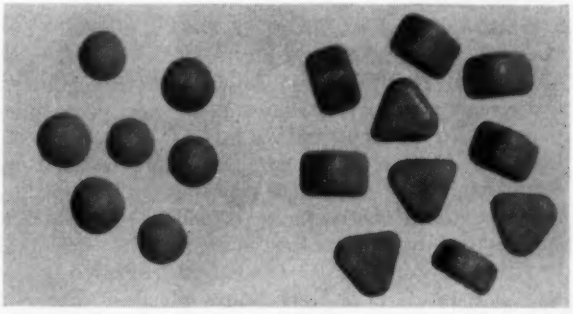
pleted and ready for cleaning in adjacent tanks.

Barrel Sizes. The friction-driven barrels are eight-sided in the body portion and have round endplates so they will roll on the powered rolls of the Hamilton-designed tumbling frames.

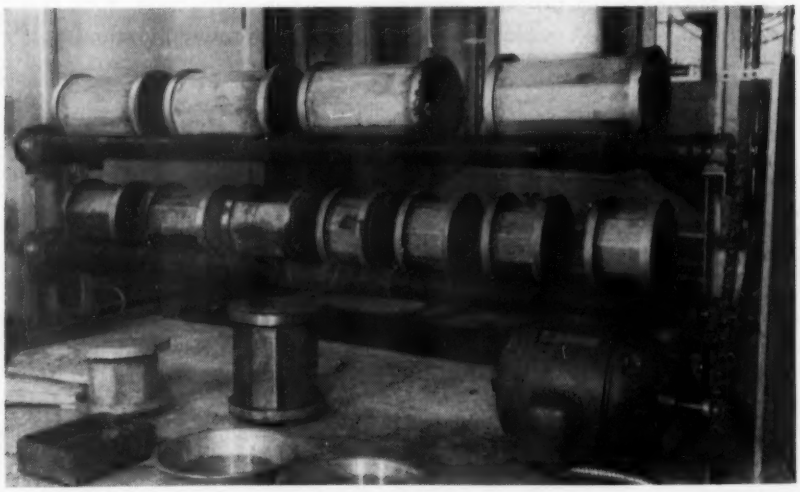
Over-all length In.	Across flats of body In.
5	5
6	5
10	5
12	5
6	6
10	6
12	6

Selection of barrel size for a specific job is determined by laboratory tests on a specific piece part and this is entered on the process sheet. For a production run, the barrel size is determined by whether a full lot or a multiple thereof is to be processed. The barrel should never be more than three-fourths full, when loaded with parts, abrasive, shot or pins, as called for in process specifications. The liquid medium, if required, should cover these materials by 1 in.

Barrel Material. Barrels for tumbling fuse plates are 20 in. in dia by 32 in. long, are made of ¼-in.



FUSED ALUMINUM OXIDE in shapes like these is employed for tumbling fuse plates, because the abrasive erodes into fine particles that remain suspended in solution. Balls are used when sharp edges are to be rounded, but there is little burr



FRICTION-DRIVE of stainless steel barrels permits several to be driven from one power source. Barrels rest on powered rubber-covered rollers, and can be picked off or laid on the rollers without stopping the machine. Also, the construction of barrels is cheaper

CLEANING OF FUSE AND WATCH PARTS after tumbling and sieving proceeds through several stages, ending with centrifugal drying with hot air blast. Result: bright clean work that has no rust stains or discoloration, and can be plated immediately if desired

steel or stainless steel, and lined with maple or a rubber-base material. Speed is controlled between 18 and 28 rpm by a variable-speed motor. Cost of these home-made barrels is about 10% of commercial equipment.

Watch parts are tumbled in 8-oz octagonal glass jars and in plasticized organic-lined stainless-steel barrels driven by friction rolls. In both instances, a non-corrosive barrel material is required to prevent rust or stains on the work.

Barrel Lining. Most tumbling barrels used by Hamilton Watch are lined, especially if a high finish is required on the parts. Wood has proved unsatisfactory, except for fuse plates. Hence, the plant lines the stainless-steel barrels with rubber or plastic. The latter is a black vinyl plastic—Miccrosol E1003 plating-rack covering—which is sprayed into the barrel interior and then baked. A durable coating is produced at a very nominal cost. Savings up to $30 per barrel lining are reported.

Hard metals are generally tumbled in unlined barrels, and at high speed, to obtain necessary violence of action. Soft metals are tumbled in a lined barrel with a solid abrasive and dense liquid.

Shaker Tumblers. Small steel parts that do not have sufficient weight of themselves to respond to ordinary barrel tumbling are placed in wood-lined shaker barrels. These barrels, of Swiss origin, are reciprocated rapidly with a snap action, to throw the contents back and forth. Abrasive is introduced with the work (small steel pinions for example) in sufficient quantity to cushion the delicate parts.

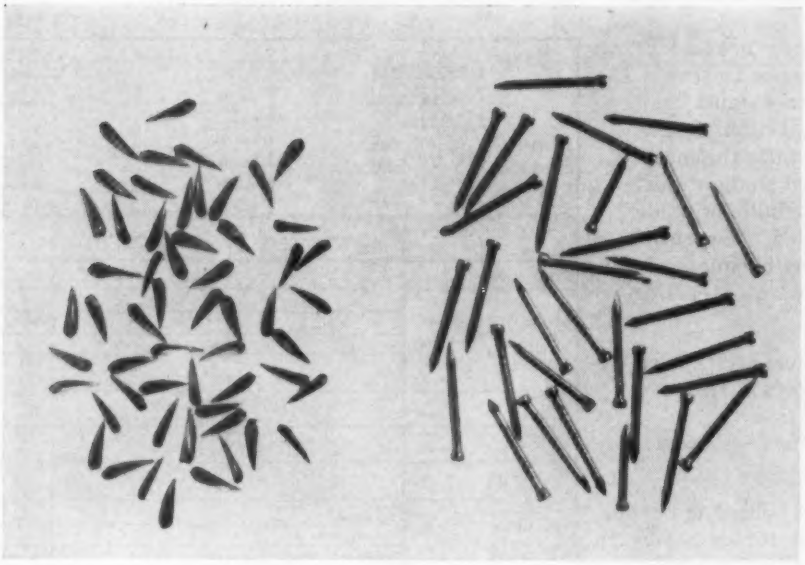
Shakers are relatively small, and have conventionally been mounted on building walls or columns to get them out of the way. But they are so useful that steps have been taken to mount them in a castered frame that allows a certain amount of portability. And there is a possibility that shakers will be set up in batteries for production tumbling of various small watch and instrument parts.

Abrasive characteristics

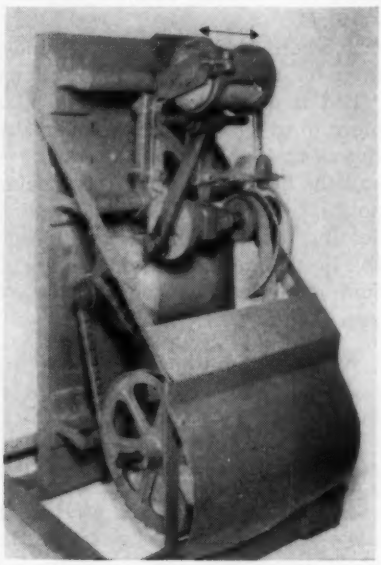
Whenever a part requires drilling, tapping, or presswork in subsequent operations, it is essential that tumbling abrasives have these characteristics:

1. No impregnation of the metal; otherwise, tool wear and costs will increase.
2. Solid bonding, so the abrasive will erode slowly in fine particles and not fracture into pieces that can lodge in holes or recesses.

EXAMPLE: In tumbling brass fuse plates, "Pebs" fused aluminum oxide in the form of balls, rods or shapes is satisfactory, because the material erodes slowly, despite violent tumbling action. An alumi-



POINTS OF CASE HARDENED BRADS deburr gear teeth, have enough weight to do the job. Hardened nail fins (refuse from nail pointing) deburr holes without enlarging them



SHAKER-TYPE TUMBLING MACHINE has the violence necessary to deburr small steel pinions

num oxide in small mesh sizes would be unsatisfactory on some small watch parts because it might pack into holes and recesses. Acid dipping could be used to remove accumulations but at the expense of close tolerances and high finish.

Abrasives Used. For fuse plates the "Pebs" balls and shapes are used. For watch parts, the following materials are selected for about 60 different small gears, pinions, etc, produced from various metals.

For brass and soft metals—300-mesh garnet, a substance that fractures into round, non-packing particles that will not load.

For steel—150-mesh quartz sand, when a normal burr is encountered or only burnishing is required; otherwise, for a heavy burr, the action is speeded with No. 3 Roto-Finish aluminum-oxide compound.

Types of slugs in use

Slugs used are 1/16 x 9/32-in .burnishing pins, 1/16-in. diagonals, 1/8-in. cones, casehardened brads and casehardened nail fins (refuse from nail-pointing machines). The last two items cost only a fraction of the prices for the other commodities and are case-hardened at Hamilton Watch.

When abrasive is added to the tumbling process, as when heavy burrs must be removed, the slugs are roughened by tumbling. These roughened pins are kept separate from smooth pins, which are used for burnishing only (without abrasive).

The casehardened brads are particularly effective for cleaning the profiles of small gear teeth. The nail point easily enters the space between the teeth. Brads cost about 40¢ per lb ready for use.

Casehardened nail fins are particularly good for getting into holes as in a nickel-silver watch plate. They will not enlarge the holes as abrasive would, nor round edges excessively. An excellent, high-quality surface is produced, so rhodium plating can be applied directly without intermediate buffing. Cost of nail fins is about 10¢ per lb casehardened.

Solution Characteristics. The tumbling solution should have certain characteristics.

1. Buoyancy or flotation properties of the liquid in combination with the abrasive have an effect on the violence of the deburring action or the burnishing action, as the case may be. An alcohol, for example, has an entirely different action from that of a soapy solution.

2. By decanting one liquid and replacing it with another, it is possible to both deburr and burnish with the same abrasive without removing the work from the barrel.

3. Lubricity, as from a soapy solution or detergent, is important to some burnishing operations. On the other hand, for deburring, one would choose a liquid with lower viscosity and greater wetting power.

4. Controlled chemical attack on the work is generally required. Because of the small weight of

instrument and watch parts, and often because of their fragility, the tumbling action cannot be severe.

But it is known that chemical attack must take place in order to assist the burnishing action. Selection of the vehicle must therefore consider the metal and the oxides formed. The blackened sludges must not be rubbed into the metal, and a metallic or oxide coating on the pieces must be avoided. Therefore, the liquid must be chosen to keep the chemical action going but without pitting. Control of pH is important.

Standard Solutions. Because chemical attack is an essential part of the tumbling process, standard brightening materials for watch parts are:

For brass—cream of tartar; for steel—a proprietary compound known as S-11.

Special Combinations. Every effort is used to employ a standard process specification for new jobs being considered for tumbling. Usually the correct procedure is determined by running 8 to 10 sample lots in the laboratory and checking the results with the production and inspection departments concerned. Special problems do arise because of the metal involved or some characteristic of the workpiece. Examples: A silver item is burnished with diagonals, and a solution containing cream of tartar and CN42, an Antara detergent. Another silver item, a contact, is processed with No. 16 shot instead of the diagonals, but the same chemicals are used. To secure a bright finish on steel and stainless-steel parts, the brightener used is a chelating compound mixed with 10% sodium hydroxide.

BARREL FINISHING
DATA SHEET
Purpose:
Burnish — Deburr
Improve Finish — Remove Lines
Other
Location

Date
Part No. Lot No. Pcs.
Name
Test No. Dept.
Submitted by
Material M.A. No.
Condition Engineer

		Rough Finish	Intermediate Finish	Burnished Finish
PARTS – Quantity				
BARREL	Size			
	Type			
	Lining			
ABRASIVE	Name Amount			
METAL SLUGS	Type Amount			
LIQUID	Name Amount			
Bbl. Speed r.p.m. Time				
Barrel Motion:		End over end		
		Horizontal Rotation		
		Shaker		
Separating Procedure				
Results:				
Remarks:				

Recovery of parts

When a barrel load has been tumbled for the specified time, it is essential to have equipment and methods for efficient separation of the work from the slugs and abrasive. Watch parts are processed for further use in six steps.

Step 1. Four-way separation of the barrel contents:

a. The load is dumped into a power-driven sieving machine. The top sieve has mesh selected to retain the parts and pass the slugs. Two water sprays rinse abrasive and tumbling solution from the work.

b. The slugs are caught by the lower sieve.

c. Abrasive is trapped in a series of baffled tanks. Note: For watch parts the abrasive is relatively fine. For fuse parts, another sieving operation is required to separate the fused aluminum-oxide balls or shapes for re-use.

d. The rinse water containing metal oxides, chips and abrasive is collected in a sump tank equipped with baffles. The heavy material settles and the water containing suspended matter is pumped into other tanks for settling, after which the water is discharged to the sewer.

The work is transferred to suitable baskets and is treated as follows in equipment located nearby:

Step 2. Rinse in warm water.

Step 3. Dip in soap cleaner.

Step 4. Rinse in hot water.

Step 5. Rinse in cold water.

Step 6. Rinse twice in alcohol to absorb water droplets, and dry in centrifugal drier with hot air blast. (Note: Step 6 is not required for non-ferrous parts).

Pins, slugs, brads, nail fins, etc, are cleaned and dried in the same manner and returned to storage bins.

Careful attention to cleaning and drying the work and the slugs avoids rust stains and discoloration, which is particularly important, of course, in respect to the work.

Studies are being continued of abrasive materials and chemicals as well as commercially available compounds. New applications are constantly being tried for application of tumbling for burr removal and final finishing, in order to eliminate hand work. Our savings to date have been far beyond expectations and hence we shall endeavor to apply tumbling to as many of our production parts as possible.

Round Table

That's MY brain-child!

"Have you cooled off since last night, Al?"

"I'm still mad, Ed. The nerve of Harrison passing along my idea as his own! I should have a patent on that turntable."

"I thought any inventions by employees were assigned to the company automatically as a condition of employment, Al. You signed the statement on your employment application."

"Maybe so, but at least Harrison should have given me credit for the idea when he introduced it in the foremans' meeting last night. Besides, don't you think I should get extra compensation for figuring out something that will save the company thousands of dollars?"

"Harrison might say that's what you're getting paid for, Al. After all, a foreman is supposed to think of better ways of doing the work.'"

"Nuts to that, Ed! Look, I figured out that gimmick on my own time, and I suggested it to Harrison about a month ago. He told me to send him a memo, outlining the idea, and I did. Then last night he stabs me in the back!"

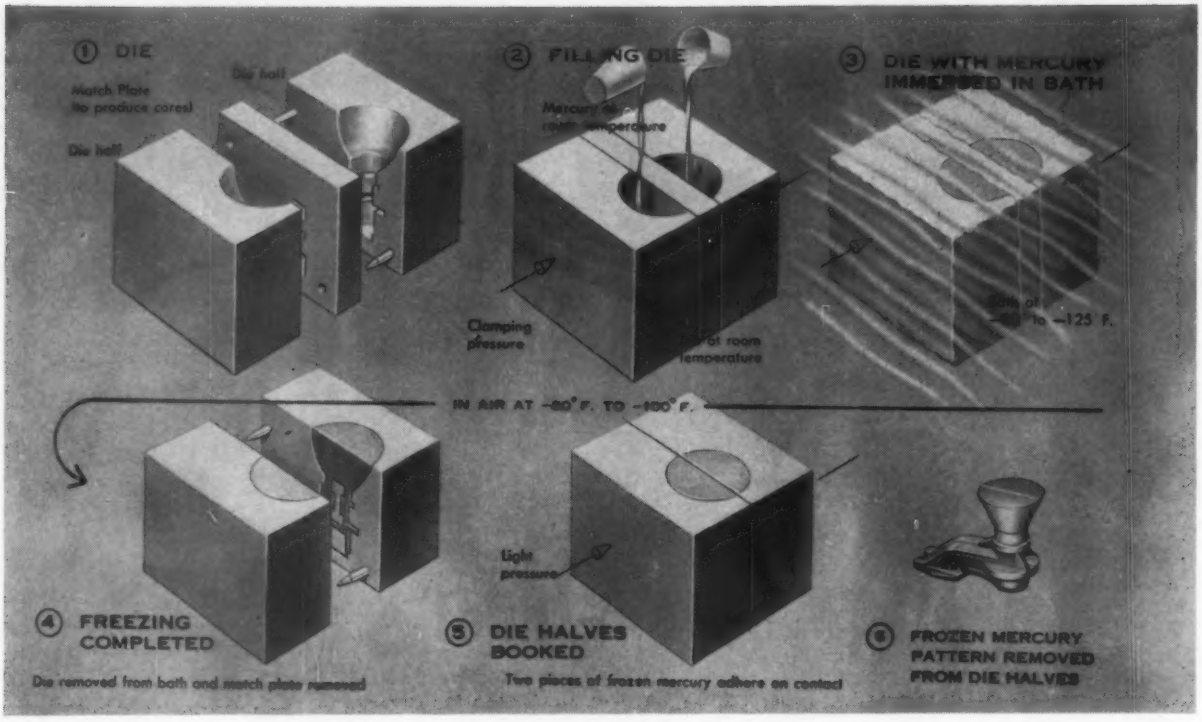
"I doubt if you really spent only your own time working it out, Al."

"Well, most of it was my own time. Besides, how can Harrison pass it off as his own idea when I'm sitting right in the room? He's got more nerve than anyone I ever ran across before."

"Maybe you'd better ask him about it. He might have read your memo, then forgotten that you gave him the idea."

"Mighty convenient forgetting, Ed. I suppose he'll forget again when raise time comes around, and when the next promotion opens up."

***SHOULD** Al's idea rightly be his own to patent? Could Harrison actually have forgotten where he got the idea—or can he really think it's his own? Your opinions on the subject may help others in the same fix. Discussions of earlier topics appear on page 166.*

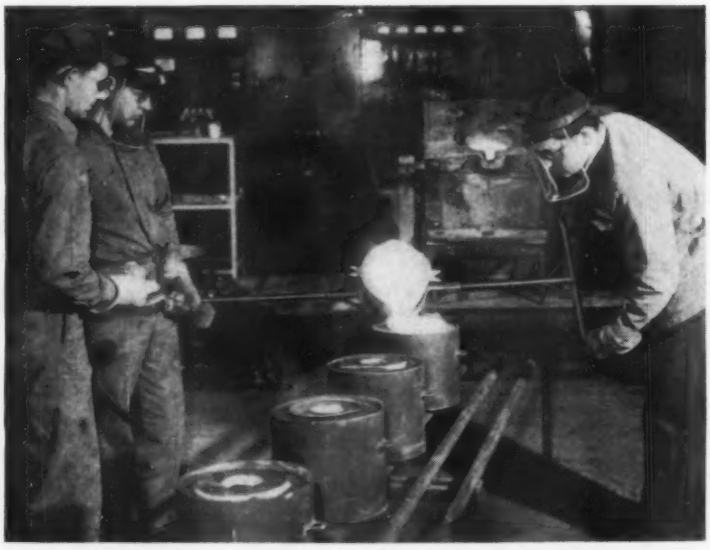


MERCURY PATTERNS are made in the sequence shown: assembly of the die sections with a match plate to provide cores, filling the die with mercury, immersing die in freezing mixture (–100 F), removing match plate, assembling pattern by "booking," and completed pattern. "Booking" is a characteristic of mercury to weld to itself with very light pressure. Good wetting characteristics permit mercury to fill small openings as well as complicated and intricate shapes

Frozen mercury solves unusual

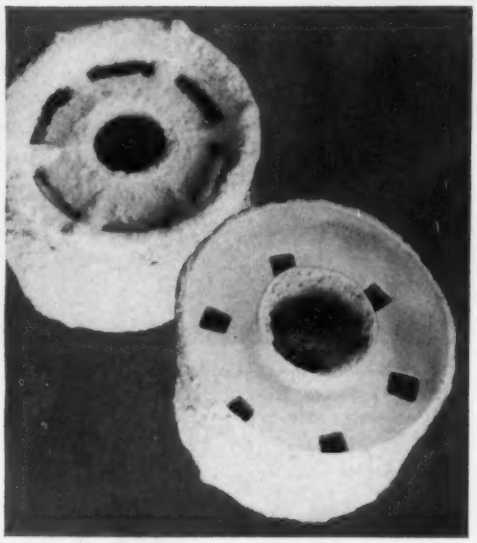
IRVIN R KRAMER, vice president,
MERCAST CORPORATION, NEW YORK CITY

Investment casting is an ancient and respected art, now in wide demand as a means of producing intricate and complex shapes with a minimum of machining. As parts operate at higher temperatures and pressures, and weight or miniaturization become critical, stresses increase and so does the demand for more complicated shapes, plus more accurate control of dimensions. Alloys such as nickel, chromium, and cobalt-base refractories impose new conditions which cannot be met with conventional production methods. Investment casting provides one means for satisfactory results and, with the advent of "deep freeze," frozen mercury has developed as an excellent pattern material for large and intricate castings. Here is how to use it . . .



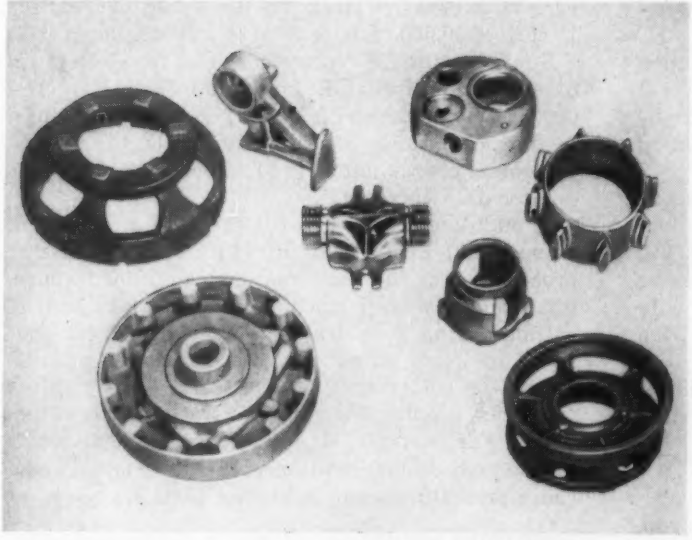
METAL IS POURED into the ceramic mold, which is set into a container and backed up with sand or shot, from a ladle. Most metals can be cast by this process, which offers a wide choice of pouring and preheating temperatures. Grain size and other metallurgical characteristics can be closely controlled. The thin, uniformly permeable ceramic shell mold permits pressure, centrifugal, or suction casting techniques

FROZEN PATTERN IS DIPPED into a ceramic slurry to build up a thin shell mold around the pattern. Dipping is repeated until the required thickness is reached — about 1/16 to 1/8 in. This thin mold, somewhat unique to the frozen mercury process, is the basis for many advantages such as more even cooling of the cast metal and faster mold firing. After completion of the shell, the mercury is allowed to melt and run out; then the shell is fired at 1850 F for two hours

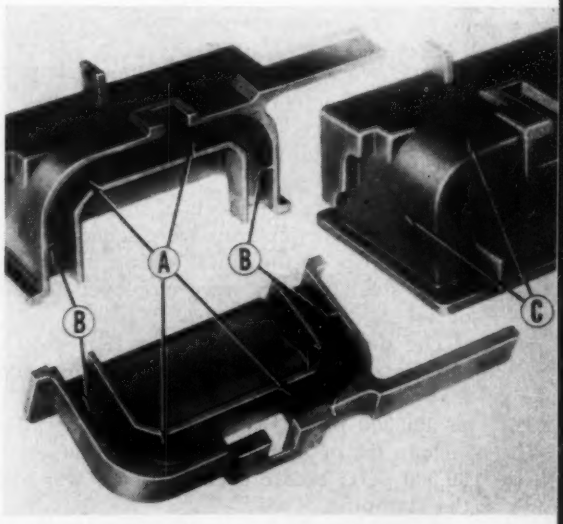


CERAMIC MOLD after the mercury has melted out contains a cavity of precise dimensions and shapes. Notice the smooth wall finish in the cavity. Rapid cooling of the metal against the shell wall produces fine grain and good surface structure in the cast part

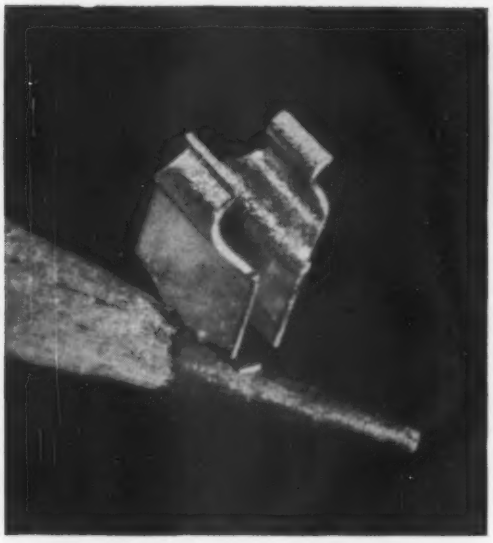
pattern problems



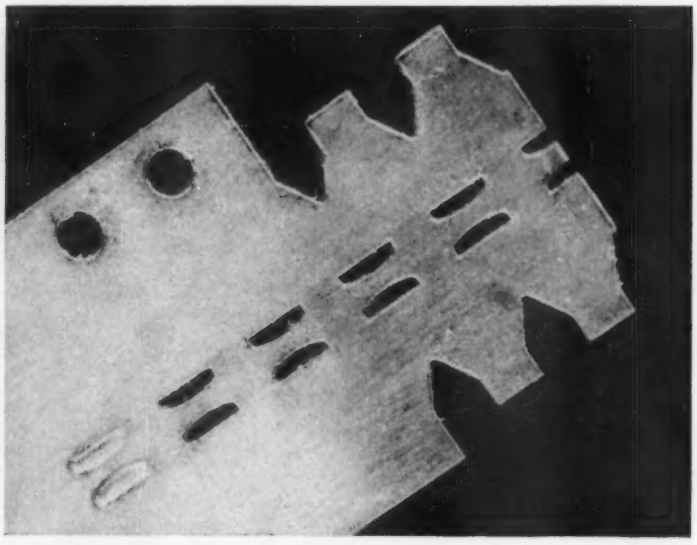
TYPICAL PARTS cast from frozen mercury patterns include many complex shapes, hollow sections, thin walls, and large flat areas. Steel castings have been produced which have a 42-in. dia and weigh 300 lb, and this is by no means the top practical limit. Very little additional work is required to complete the parts as cast, hence sizable savings in machining cost are possible. Dimensions are held to plus or minus 0.003 in. per in.



WAVE GUIDE is produced in two dies, is cast in 88-8-0-4 bronze, and weighs 1-⅜ lb. "A" surfaces, difficult to reach for machining, are used as-cast. Surface finish is 63 mu-in. rms and total tolerance is held within 0.003 in. Iris sections shown at "B" are cast into the piece. Part is booked down the centerline as shown at "C", yet dimensional and finish tolerances are held across the booking line. Because part is used as cast, cost is unusually low



TEST PART: small spring, heart of a sensitive switch, must be produced from 0.010 in solution-annealed beryllium-copper strip



THE STAMPING: it must be burr free and held to close tolerances. This one was rejected for excessive burr after die run of 60,000 pieces

When you use beryllium copper...

New tests show beryllium oxide on strip can mean a difference of 10-to-1 in die life. Here's how it happens and how to avoid it

In pressworking beryllium-copper strip, the presence of refractory beryllium oxide may upset the most careful estimates of tooling charges—turning an otherwise profitable job into a diemaker's headache.

To determine the effects of surface condition upon die life, production runs were scheduled for several lots of strip on the small spring illustrated. High-speed steel punches were employed in anticipation of severe service.

The die was used in production until excessive burrs appeared upon the product. Although a normal run for clean beryllium copper strip is 150,000 to 500,000 pieces, the presence of beryllium oxide on one lot of material reduced production to only 60,000 parts before excessive burr was observed on the stamping.

In addition, extreme dulling of all cutting punches resulted from the abrasive action of the oxide film with radii worn on all cutting edges.

DIE WEAR MEASURED

Upon redressing the die following the above run, it was found necessary to remove 0.017 in. from all punches and 0.006 in. from die sections. In the case of clean stock, normal resharpening requires the removal of only 0.003 in. from punches and 0.002 in. from die sections.

Assuming a total usable depth of 0.0125 in., this die should yield 62 runs of at least 150,000 each, or over 9,000,000 stampings, with clean beryllium copper. With abrasive stock, the die would be good for 15 runs of 60,000 each, or total of only 900,000 pieces.

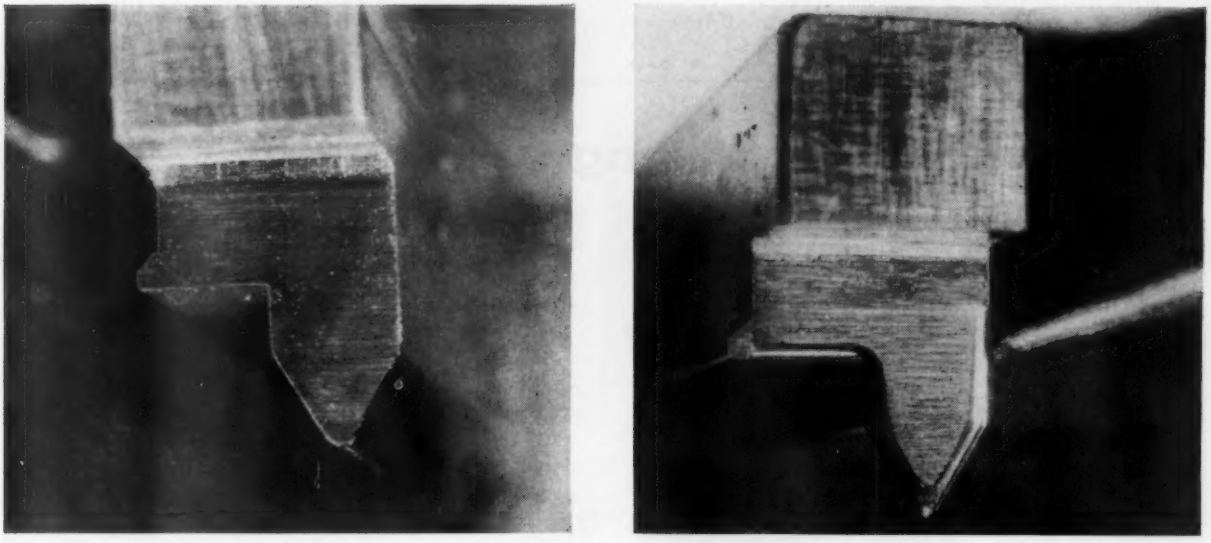
Similarly, the die replacement cost for clean strip, based upon an initial die cost of approximately $1,000.00, would be about $0.11 per 1000 stampings. In the case of strip covered with oxide, the die replacement charge jumps to $1.11 per 1000 stampings —a ten-fold increase.

In addition to die wear, the presence of beryllium oxide can be expected to introduce other processing problems. For the same reasons as outlined above, this oxide decreases machinability and may lead to galling during deep drawing. You can expect poor bonds or joints unless oxides are removed prior to plating or soldering.

Service problems can also be traced to beryllium oxide. For example, its low electrical conductivity means high contact resistance. Furthermore, it may cause premature wear in mating parts.

HOW OXIDE FORMS

The scale which forms on beryllium copper at elevated temperatures is composed of an outer layer of black cupric oxide (CuO), an intermediate layer of red cuprous oxide (Cu_2O) and an inner layer of



HSS NOTCHING PUNCH: just after sharpening (left) and after a run of 60,000 pieces on oxide-coated strip. Punch is dulled by radii worn on cutting edges from refractory oxides

CLEAN STRIP CUTS DIE WEAR

F S STICKNEY, chief engineer, INSTRUMENT SPECIALTIES CO, INC, LITTLE FALLS, NJ
J T RICHARDS, chief engineer, PENN PRECISION PRODUCTS, INC, READING, PA

gray-to-colorless beryllium oxide (BeO). Contrary to popular belief, beryllium oxide cannot be formed under ambient conditions or the moderate temperatures employed in aging or hardening of beryllium copper. Since beryllium oxide starts to form only above 930 F, its presence can usually be traced to solution annealing by the rolling mill. Consequently, the average fabricator does not produce the oxide in his own shop—he buys it.

Since beryllium oxide may be colorless, it frequently escapes identification. Red, brown, or black surfaces indicate that copper oxides or a sulfide may be present. As indicated above, beryllium oxide forms under the copper oxides, so that the latter can be removed—leaving the refractory beryllium oxide. The resulting surface frequently appears bright, but when viewed at a slight angle has a glassy appearance. Unlike clean strip which tarnishes readily in industrial atmospheres and is susceptible to fingerprint staining, the tenacious film of beryllium oxide prevents rapid discoloration.

WHAT TO DO

The solution is, of course, to specify clean strip. Material, as received, should be bright and lustrous —not dull or glassy in appearance. A dark surface suggests that neither beryllium nor copper oxides have been removed.

The aging treatment (500-800 F) generally applied following forming will not produce beryllium oxide upon strip received in a clean condition. The discoloration resulting from hardening is caused by cupric oxide.

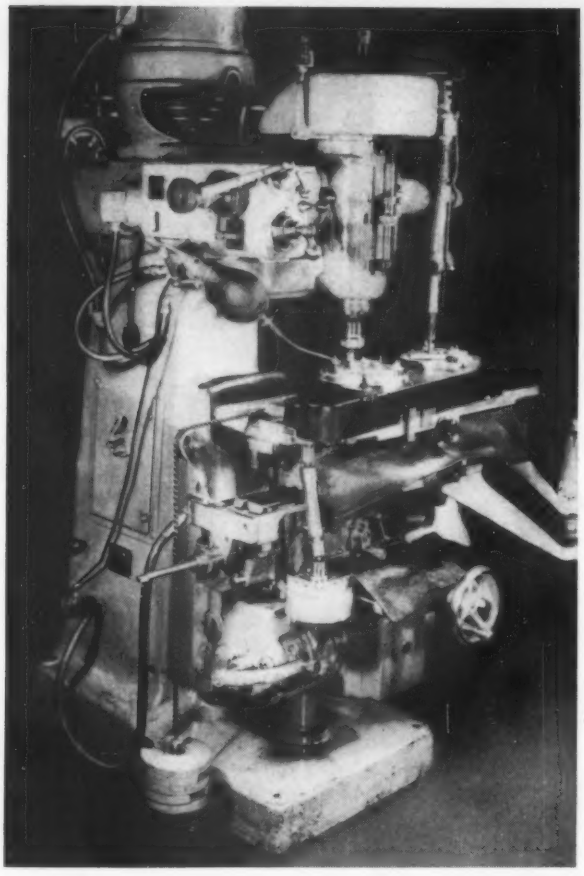
Several spot checks now in use depend upon the refractory nature of beryllium oxide. In one, a sample is held in a bunsen-burner flame. Clean strip will immediately discolor. On the other hand, discoloration will be more gradual, if not slightly delayed, with material covered with oxide. In another test, the ability of solder to wet the surface of the sample with only the assistance of rosin flux is an indication of clean strip.

In certain critical applications, the use of cadmium-plated stock may offer advantages. The added lubrication provided by cadmium means greater formability with decreased die wear. In the example discussed above, cadmium-coated stock will increase production runs from a minimum of 150,000 pieces to at least 300,000. This improvement is typical.

Cadmium plating may not always offer the lowest-cost answer. The resulting decrease in processing costs must outweigh the increase in raw material price. For those applications where cadmium plating cannot be justified, the best solution is to be found in clean strip.

Practical Ideas . . .

Shop-Made Cam-Milling Attachment



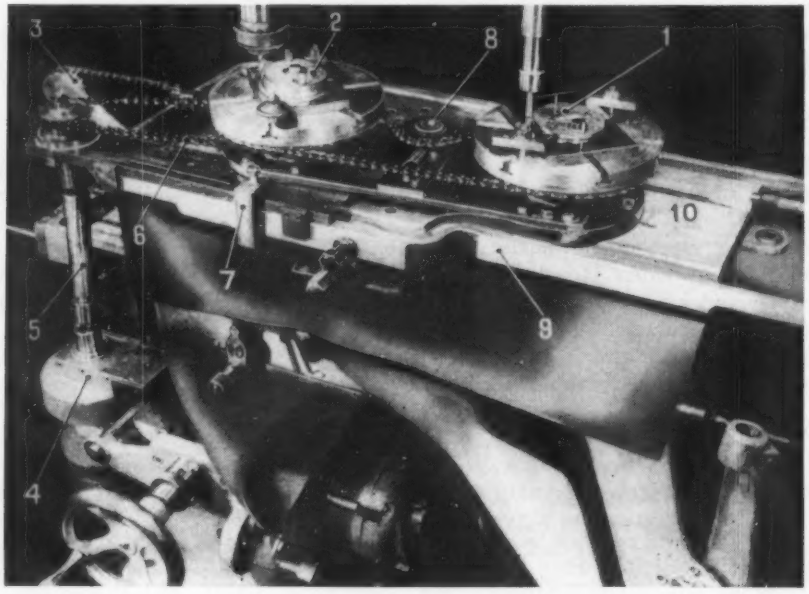
This cam-milling attachment was made from materials at hand, except for the worm gear and universal joints. Although the cost of the attachment is low, the time for the operation was cut 1/3.

The main details are: 1) a cam attached to a rotary table; 2) the work, attached to a similar table; 3) a sprocket which supports a weight to keep unwanted movement out of the sliding machine table, and to hold the cam against the stylus; 4) a drive takeoff, with 5) a universal-joint telescoping drive-shaft to supply rotary movement to the tables; 6) a chain which turns the worktable; a second chain-and-sprocket links worktable and cam table; 7) C-clamp holding the pantograph table to the machine table; and 8) spring-loaded sprocket which takes backlash out of the rotary movement, making sure both tables are synchronized.

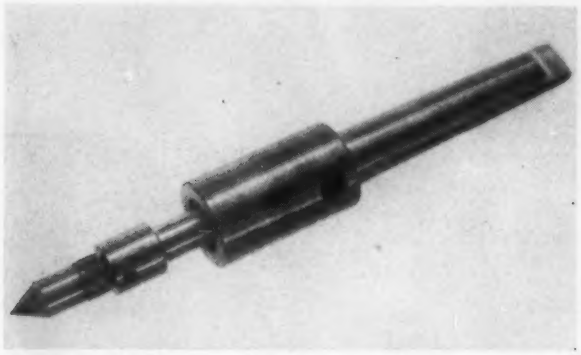
The maximum stroke of the table is 3½ in., which becomes radius when turntables are added. This allows large work to be accommodated without moving the setup.

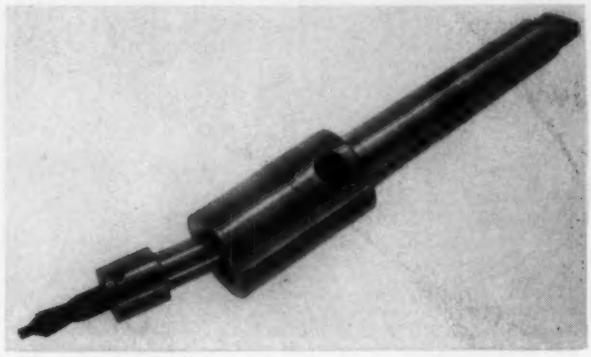
The weight at the end of the chain assures an even pressure on the stylus, improving accuracy over hand-held followers. Because the job is turned by a driveshaft, the operator can prepare the next load while the machine is working.

Turntables are made of aluminum, with steel shafts in plain 3-in. diameter bearings. A large washer between the nut at the end of the shaft, and the bearing, acts as a brake, helping to prevent backlash. The tables have a protective cover in place during cutting. *N Forbes, Edinburgh, Scotland*



CLOSEUP of duplicating heads, with protective cover removed to show detail of sprocket linkage and drive method. Pantograph table is clamped to machine table which is locked so as to travel only left and right. Movement of the cam in and out causes the weight to rise and fall, keeping constant load on cam follower. For finishing cuts, milling cutter and follower should have same OD





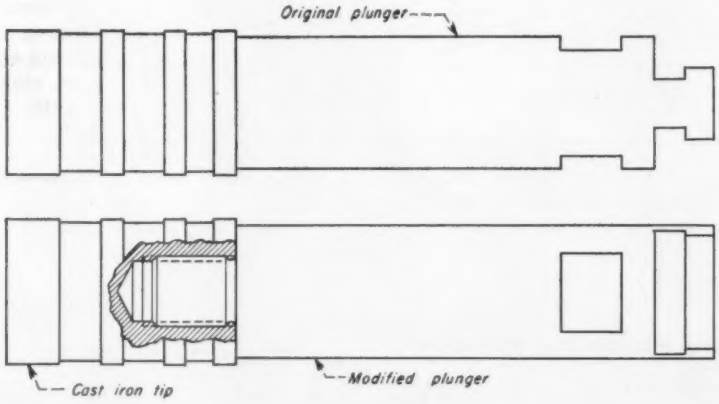
"Wiggler" Cap Aids Center-Drilling

This handy tool is a large version of an ordinary wiggler, but it has a ball joint which can be locked in place after the tip has been located to run true.

In use, the operator locates the hole, locks the setscrews, and removes the wiggler-point cap. The center-drill underneath the cap is then used to drill the hole.

The ball joint is locked by an internal cap, one end of which is shaped to fit the ball, and the other end of which is conical. The locking setscrews have a corresponding taper-point to wedge against the conical end of the ball-lock.

This device is very effective in large radial drills when it is hard to locate the drill on a scribed layout. *R J Lemp, Sayville, NY*



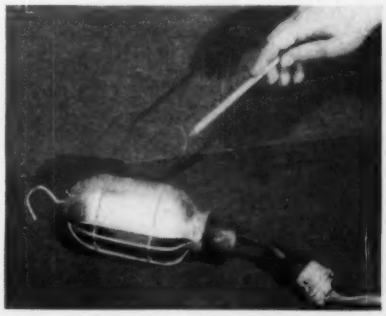
Improvised Cast Iron Plunger Repairs Die-Casting Machine

We made the repair shown above, to keep our die-casting machine in production after the machine had broken down. The metal pot on the machine for zinc-base alloys cracked, and we had no replacement for it. All we had were used pots with worn out cylinder sleeves and plungers.

Because we were in a hurry for the machine, we took out a worn plunger, and, after annealing it, we machined down the working end, leaving a ⅞-in. threaded stud as an adapter for a cast iron tip of pearlitic iron), with the same working shape as the end of the original plunger.

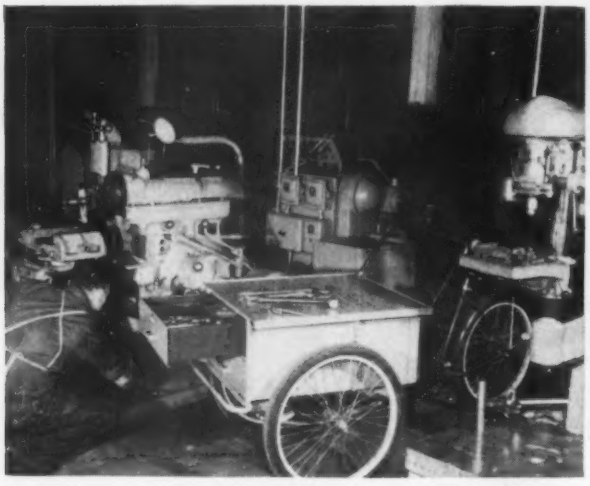
This plunger worked well in the worn cylinder, so we replaced the plungers of all the used pots in the same way. It is not necessary to make new plungers, because we are now using old plungers modified for cast iron tips, as shown.

This system enabled us to increase cylinder life and save money formerly spent on replacement of the whole plunger. Changing cast iron tips is helped by the fact that we always have some oversized tips in stock, to allow for various degrees of cylinder wear. *Paul Forsberger, Sao Paulo, Brazil*



Extra Hook Aids Trouble Lamp

An extra hook soldered to a trouble lamp, as shown, makes the lamp handier to use. The single hook at the end of the shield often makes it difficult to arrange the light so it shines downward onto a work area. *Lucien R Greif, Thornwood, NY*



Tricycle Carts Save Time, Cut Fatigue

Fatigue is a major factor when machine and die repairmen must move heavy tool carts about a large plant to reach production units where their services are needed. Too often, by the time the repairman reaches the machine he must rest before starting work.

Specially-designed tricycles equipped with tool drawers and a steel-faced working area, now make it easy for repairmen to reach widely scattered work areas in our plant. Since they were introduced, the average time for a repair job has been cut substantially—and there no longer are objections to long hauls by the repairmen.

Equipped with all of the tools necessary for most of the repair jobs in our plant, these carts can be moved rapidly along shop aisles with little fatigue. And usually they can be located close to the machine being repaired, saving the repairmen many steps during each job. *J G Schlindwein, tool supervisor, Lyon Metal Products, Inc, Aurora, Ill*

Winner No. 215 of $25 IN ADDITION TO REGULAR PAYMENT

for the best PRACTICAL IDEA

IN THE OCT 25 ISSUE, A TIE. $25 EACH TO:

- **H W Holmdahl,** Honolulu, TH, **'Formula for multiple-lead threads'**
- **M Barash,** Haifa, Israel, **'Slicing knives cut rubber'**

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

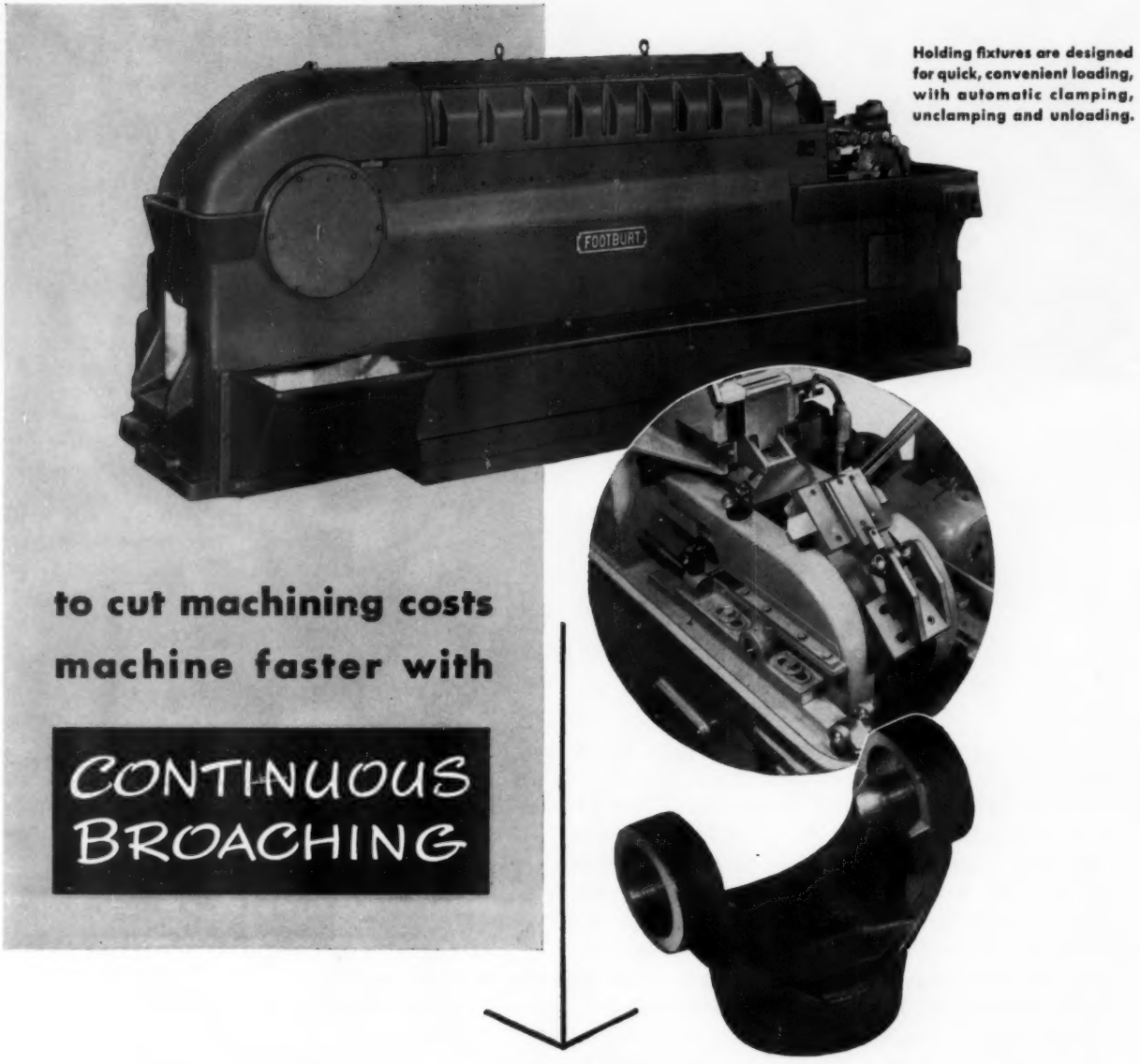
PAYMENT — $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received — usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and change entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author — every item will be edited in accordance with *American Machinist*st standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



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The Self-contained Fixture has its own pneumatic power unit to pull or push the broach. Just set it on a table, connect it to the air line and you are ready to start broaching. Or you may want to mount it vertically to further economize floor space.

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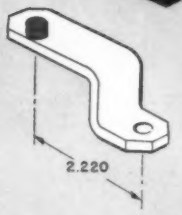

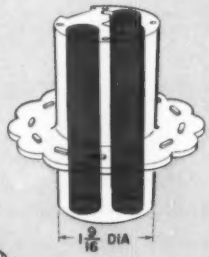

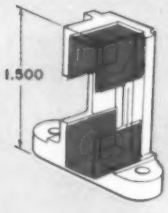

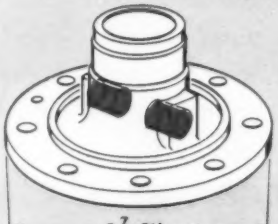

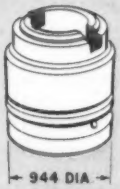

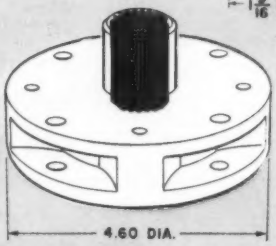

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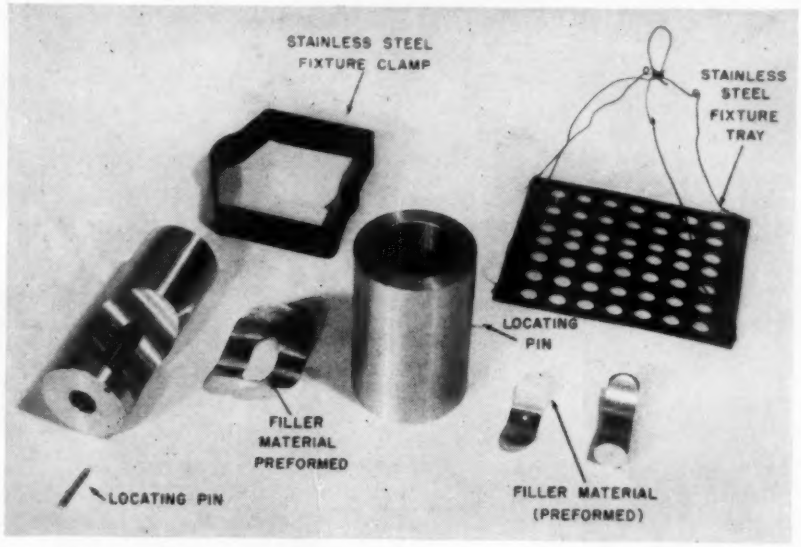
HOW TO DIP BRAZE ALUMINUM...I

THOMAS F PROTZ, chief of shop services, Guided Missiles, DIAMOND ORDNANCE FUZE LABORATORIES

Intricate aluminum parts can be brazed by dipping into molten flux. Where neither welding nor riveting is appropriate, dip brazing can be relatively fast and easy. The steps required in the process are: precleaning, assembly, preheating, brazing, and flux removal.



CLEANED PARTS, filler material and fixturing ready for assembly and dip brazing. Locating pins hold parts in alignment and simplify holding requirements

PRECLEANING

Preclean by giving all parts a degreasing in trichlorethylene vapor or a caustic etch. Then submerge all parts, including the filler metal, in a solution of one part hydrofluoric acid, one part nitric acid, and 98 parts water. Keep parts submerged for two or three minutes until there is etching activity on all surfaces. Excessive time in this bath will result in a rough surface, uneven flowing of filler metal, and a poor joint. Rinse the parts in hot water at 180 to 200 F. Dry quickly to prevent water spots.

ASSEMBLY

Areas to be brazed must not be touched by the operator (or anyone else) during assembly. Place preformed filler metal into the brazing area with tweezers.

The amount of filler metal required must be determined by experiment. Some joints require a larger fillet or deeper penetration than others.

Filler metal can be made from 718 aluminum brazing alloy. At Diamond Ordnance it is received as wire and strip, rolled to thicknesses of 0.002 to 0.003 in. for lap and butt joints, formed, and cut to size. When large quantities are required, forming and blanking dies are used.

Brazing sheet, an aluminum stock clad with 718 brazing alloy, is useful for sandwich assemblies.

Parts for a dip-brazed assembly should be self-jigging or self-aligning whenever possible. Pins, steps, flanges, counterbores, and other features can often be placed to avoid jigs or fixtures. An ideal design is one in which the assembled parts are held in position by a single spring.

Sheet parts can be spot welded after the filler-metal shims have been inserted to hold the assembly in position for brazing.

PREHEATING

The assembled parts, with filler shims inserted properly, and clamps and springs also in place, are dipped as a unit into the hydrofluoric-nitric acid solution used in precleaning for one to two minutes. Rinse in hot water and place in an electric furnace at 1000 F.

Time required in the preheat furnace will depend on the mass of the assembly. It must be long enough to remove all moisture from the parts and should be long enough to bring the assembly to furnace temperature. This will speed the brazing operation. However, if the parts remain in the preheat furnace too long, oxidation of the aluminum surface will prevent even flow of the brazing alloy.

BRAZING

The dip bath is a ceramic pot containing granulated aluminum brazing flux held in the molten state at 1120 F ±5 F by submerged monel electrodes. The pot illustrated is 9x13x36 in. deep and holds 300 lb of flux.

Remove the assembly from the preheat furnace and submerge in the flux bath. Time in the bath can be judged visually as the part can be seen while submerged in the bath. When capillary flow of the preformed filler is completed fillets that are evenly formed and uniform will be visible.

FLUX REMOVAL

Remove the brazed assembly from the bath and quickly tilt or rotate to drain excess flux. The flux which freezes on the part within a few seconds after removal from the bath, is highly corrosive

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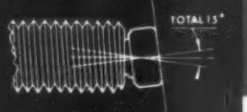
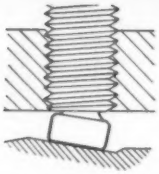
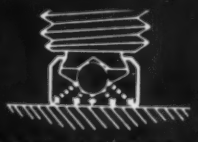
the New Vlier SCREW-BALL CLAMPS!



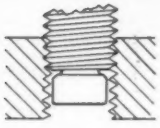
Ball-bearing construction insures frictionless, *automatic* angle adjustment and rotation; pad swivels freely in *all* directions up to 7½° from the centerline!



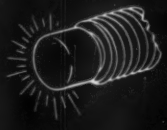
Pad seats firmly on work surface within angular range!



Force distributed equally to pad face. Conical seat distributes force equally in all directions; insures easy alignment in angular applications; greater freedom of motion.



Pad inserts from top of threaded hole or from bottom for easy installation!



Large pad area. Pad is machined from the solid, not counterbored or relieved; has greater strength plus freedom from distortion!

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TORQUE THUMB SCREWS — Apply accurate, controlled end pressures; eliminate distortion to the workpiece. 4 models; 19 sizes!

VLIER SPRING PLUNGERS — For use wherever accurate, positive spring loads are needed! 4 models; 40 sizes!

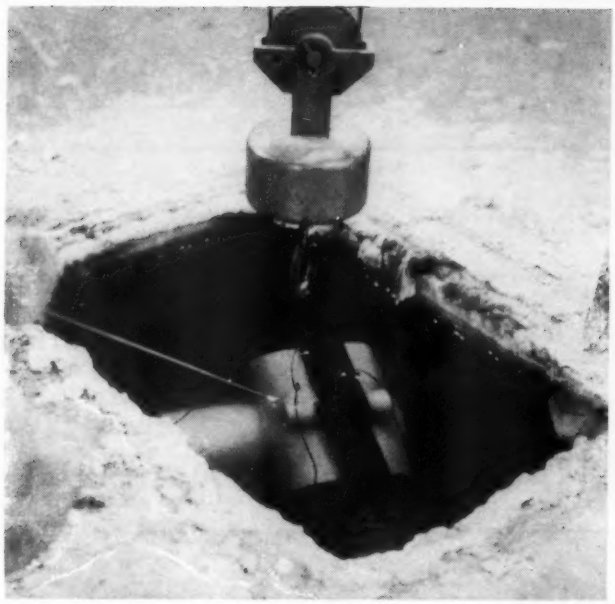
VLIER SPRING STOPS — Provide end pressures in fixtures when wall sections are not available. Two models: 14 and 32 lbs. end pressure.

VLIER TOGGLE PADS — Assure solid clamping of parts with uneven or off-angle surfaces. 5 sizes; fit almost any clamp.

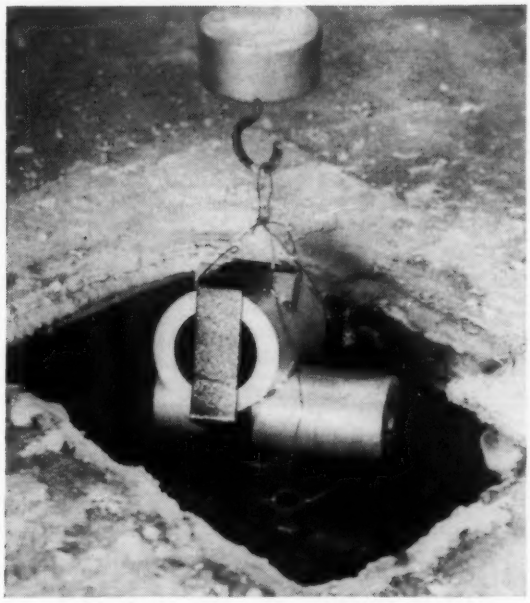
VLIER FIXTURE KEYS — New 5-Way Key fits every standard mill table slot. 3-Way model also available.

Write for your complete catalog of Vlier products today! It's free!

HOW TO DIP BRAZE ALUMINUM...II



HAND APPLICATION of filler rod is optional method. Filler is added while assembly is immersed in molten flux



BRAZED ASSEMBLY (this one made with filler shims) is removed from flux. Any remaining flux must be washed off with hot

and it must be entirely removed.

Flux is water soluble and may be readily removed in agitated hot water. To improve the appearance, use a mild caustic etch and an aluminum bright dip. However, these treatments will not remove the flux, which must first be washed away with hot water.

HAND APPLICATION

Hand application of filler metal is possible. Follow the procedure just outlined except omit filler-metal shims during assembly. With parts that have been precleaned, assembled and preheated, inserted in the molten flux, wipe joints with rods of 718 aluminum brazing alloy, 1/32 to ⅛ in. in dia.

Because the filler rod is at room temperature there is a lag before the rod temperature can be raised to the melting point by the bath. This delay is enough for the operator to reach the brazing area with the tip of the rod. Filler rod is drawn into and around the joint by capillary action.

Once skill has been developed in hand application, time can be saved in assembly by eliminating the shims and elaborate fixtures. Voids can be readily filled with additional metal.

CARE OF BATH

The bath is operated continuously with temperature controlled by an indicating pyrometer. Thermocouple of the pyrometer is submerged 18 in. in the bath. Exercise care to avoid bath contamination with copper or iron.

All holding devices used in the bath should be nickel, Inconel, Monel, or stainless steel. Steel or brass screws will result in serious contamination.

Stainless steel is the most economical material for jigs and fixtures but is also most likely to cause contamination. On short runs this problem is not too critical as the flux must be replenished to replace the carry-off when parts are removed. Where production loads are involved, nickel fixtures are more satisfactory.

CHOICE OF ALLOY

Such alloys as AA 1100 (2S), AA 3003 (3S), AA 6061 (61S), and casting alloy 195 have excellent brazing qualities and lend themselves to dip brazing.

For parts that must be machined, AA 6061 in T4 or T6 temper is a good choice. After brazing any of the alloys will be in the annealed condition. However, 6061 can be heat-treated either later or directly from the brazing bath without harm to the joints.

To stop brazing metal from forming a fillet in an undesirable position, anodize the parts, then machine only the areas where brazing is to be done. The anodized surfaces will act as a buffer to avoid excess metal buildup.

Write for your complete catalog of Vlier products today! It's free!

SAVE BY SWITCHING TO SUN HYDRAULIC OILS

If your system is in this condition	This is the Sun Oil recommended	And this is why
TIGHT SYSTEM. System never changed. Little or no make-up oil added.	**SUNVIS 900**	Exceptionally long life of Sunvis 900 keeps overall costs low.
TIGHT SYSTEM. Changed annually. Make-up oil added when needed.	**SOLNUS**	Solnus is a quality oil with a long life and a moderate price.
LEAKY SYSTEM without dilution. Where make-up averages 5% or more per month.	**SUNTAC**	Suntac cuts oil costs by reducing leakage an average of 35%.
LEAKY SYSTEM with dilution from water, cutting oil, emulsions and other liquids. Frequent change needed.	**CIRCO**	When frequently changed, Circo gives excellent protection at a low price.
DEPOSITS BUILT UP inside system from dust, sludge, varnish or other contaminants. Comparatively tight system.	**SUNVIS H.D. 700**	The cleansing action of Sunvis H.D. 700 removes deposits, eliminates costly tear-downs for cleaning.
DUAL PURPOSE. Machine tools designed so that hydraulic oil also lubricates ways.	**LUBEWAY**	A good hydraulic oil, Lubeway has the film strength needed to protect expensive ways.

No one oil can give greatest economy in *all* hydraulic systems. As this chart points out, the condition of the system must be considered. To make sure that the oil you select will give the maximum economy in your particular system, have a talk with your Sun Oil Company representative. Or write Department AM-1.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline

CARBIDE GRADES FOR VARIOUS USES

COURTESY OF MONARCH MACHINE TOOL COMPANY

Chip Removal Applications	Code No.	Adamas	Carboloy	Carmet	Firthite	Kennametal	Talide	Vascoloy Ramet	Wesson	Wiley
Abrasion Resistant Carbides	C-1	B	44A	CA-3	H	K1, K6	C89	2A68	GS	E-8
	C-2	A	883	CA-4	HA	K6	C91	2A5	G1	E-6
	C-3	AA	905	CA-7	HE	K8	C93	2A7	GA	E-5
	C-4	AA	999	CA-8	HF	K8	C93	2A7	GF	E-3
Crater Resistant Carbides	C-5	DD	370-78B	CA-5, CA-51	T-04	K2S, KM	S88	AW, EE	MWS	945
	C-6	D	78B-78	CA-1	TA	KM, K3H	S90	EM	WM	710
	C-7	C	78	CA-2	T-16	K3H, K4H	S92	E	WH	606
	C-8	CC	831	CA-6	T-31	K5H	S92	EH	WH	509
Wear Applications	C-9	A	44A, 883	CA-4	HA	K8, KE7	C89	2A68, 2A5	G1	E-6
	C-10	B	779, 44A	CA-3	H	K6	C88	2A3, 2A68	GS	E-8
	C-11	HD-20	55B, 55A	CA-10	HC	K1	C8515	2A1, 2A3	M	E-18
Impact Applications	C-12	BB	55A, 44A	CA-10	DC-2	K1	C8515	2A1, 2A3	GS	E-13
	C-13	HD-20	55B, 55A	CA-11	DC-X	K91, K92	C8020	AX	M	E-18
	C-14	HD-25	190	CA-20	DC-3	K90	C7525	AY	M	E-25

NOTE: This chart presents the manufacturers' independent recommendations for carbides for the uses indicated, and it is not intended as a grade comparison chart. It is not an endorsement of any manufacturer's products nor is it an approved list of sources.

NOTE: Where two grades are shown for a single application, the first is recommended for heavier duty.

Application of Sintered Carbide Grades to Machining

C-1 A heavy-duty machining grade for use on cast-iron and non-ferrous materials where good wear resistance is required.

C-2 A general-purpose wear-resistant grade carbide having higher hardness but less resistance to shock than the grade C-1.

C-3 Highest hardness and wear resistance of the tungsten carbide grades, used for light finishing cuts where shock is not involved.

C-4 A low-shock-resistance and high-wear-resistance grade used for light precision boring and finishing cuts.

C-5 Tungsten titanium grades having high strength and abrasion resistance used for heavy interrupted cuts and for roughing operations when using heavy feeds. Low resistance to surface cratering.

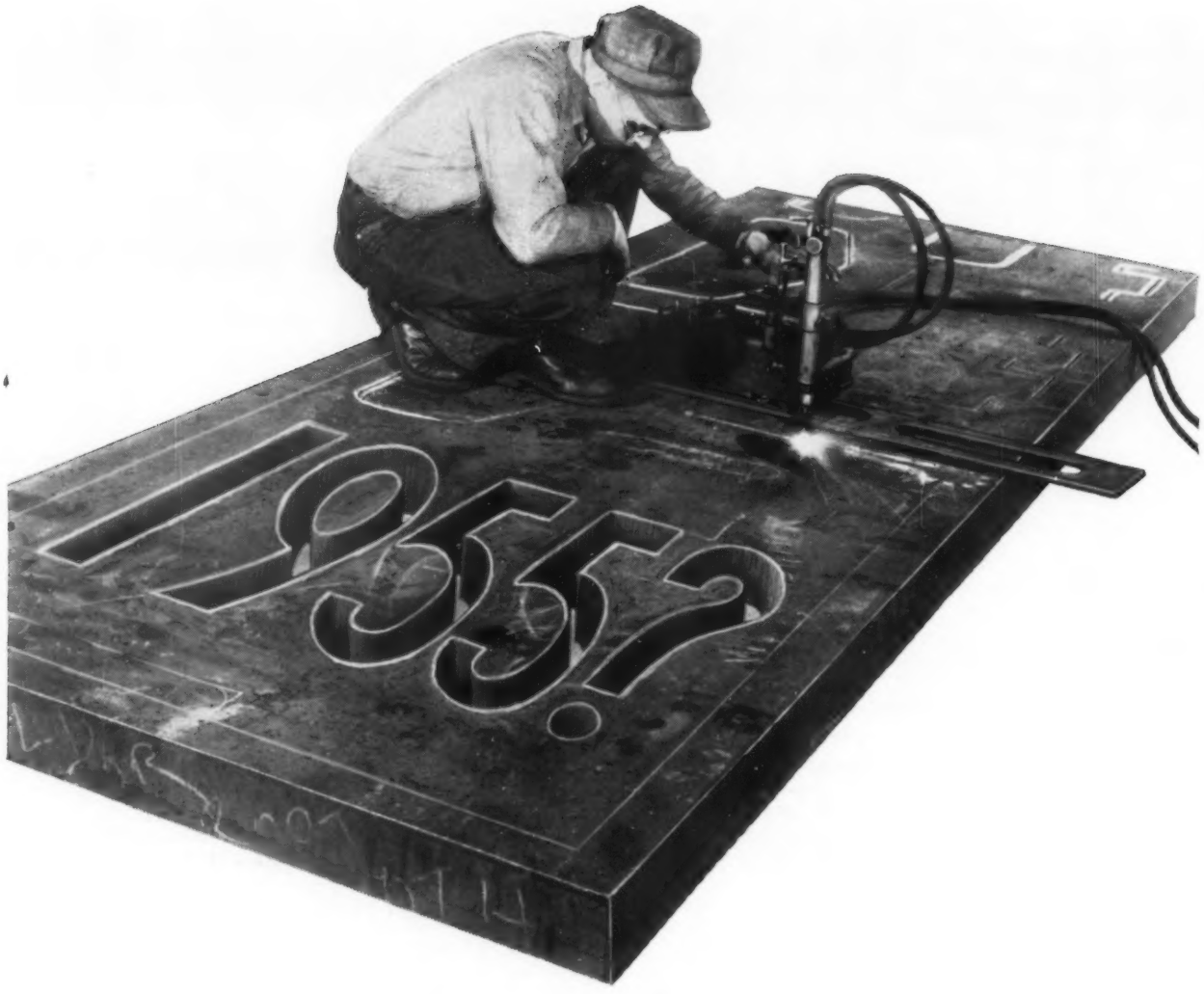
C-6 General-purpose machining grade having fair resistance to surface cratering. Used for average cuts on steel where the surface speed is not particularly high.

C-7 A crater-resistant grade of high hardness for use when machining with light feeds and high surface speeds. This grade has lower shock resistance than C-6 and is often used in mechanically held tool holders.

C-8 A high-titanium-grade carbide which is used for high-speed turning and finishing operations using light feeds and mechanically held tool holders.

C-9-10-11 For wear applications with light shock.

C-12-13-14 Wear applications involving impact and shock.



What's New in Steel Service

Again in 1955, as in every year since 1842, Ryerson is setting the steel-service pace. Many advances in our ability to serve you have been made in recent months—many more are immediately ahead. Briefly, here is what you can expect:

EXPANDED STOCKS—Amazing new leaded alloys in three carbon ranges—carbon steel plates produced to an "easy-welding and forming" specification—304L and 316L stainless plates and sheets for superior welding characteristics—type 430 stainless sheets for those who want an alternate to higher priced 18-8 stainless. These are a few recent additions and further stock expansion is already under way.

NEW QUALITY SAFEGUARDS—Steel you order from Ryerson now protected by a whole new set of quality control standards—tighter than any thought possible before. As evidence of uniform high quality we can furnish a certificate of analysis or a mechanical properties report for every pound of steel we ship.

STEPPED-UP SERVICE—On 92 to 98% of the regular orders we receive, steel is cut and shipped the same or following day. With two new plants getting into operation, and with facilities enlarged and modernized from coast to coast, we'll do even better in the weeks ahead.

So here's our steel-service pledge to you—an even wider selection of steels, dependable high quality, delivery where you want it—when you want it—now and throughout 1955.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloys, stainless, reinforcing, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Talking Shop . . .

Plumber Einstein

YOU PROBABLY READ that, following Dr Einstein's assertion that he'd be a plumber if he were starting over, several unions sent him cards. But Toledo Pipe Threading Machine Co went them one better and sent a kit of four tools: hand threader, pipe cutter, pipe wrench, and vise.

Industry—Biggest Teacher

APPARENTLY about half the nation's 60 million workers are taking some kind of training, at a cost of some $10 million and 5 to 10 billion man-hours a year. Complete information is not available because the over-all program has grown so big since WW II, according to Minneapolis-Honeywell's Industrial Div in Philadelphia.

Why I-Beams?

IN A RECENT DISCUSSION on design for casting, one engineer pointed out that the designer who uses I-beam shapes for cast sections is just as wrong as the one who 20 years ago used casting shapes on fabricated designs. The I-beam is a section designed for rolling. In casting, a tubular or triangular section can readily be achived, and is stronger for the same weight of metal.

That Office Party!

ASSOCIATED INDUSTRIES of Cleveland recently surveyed its members about Christmas parties, found that the predominant party type (75%) today is one for employees' children. The employees-alone party has been dying since the end of WW II. Personnel Dept handles the party in most cases, and it is held in a big hall away from the plant a week before Xmas. Food is usually candy, nuts and fruit, presents are toys in profusion, sometimes graded for age. Most parties last 2½ hr, have professional entertainment. Average tab was $4,635 for everything, but varies directly, of course with company size. Actual cost is $4 to $5 per employee, less of course on a per-child or per-person basis, because each employee represents about four people.

Real Thanksgiving?

DO PLANTS OPERATE the day after Thanksgiving? The answer is "Yes," at least in Cleveland, according to a 1954 survey there. Of 50 companies, 28 worked as usual, 10 didn't, 12 more were undecided at the time of the survey. Hourly workers were not paid if they didn't work, except in two companies which have granted that Friday as a seventh paid holiday, and one which granted it in lieu of a Christmas holiday, because Christmas fell on a Saturday in 1954.

This is a far cry from our own days of 25 years ago, when Christmas was observed by letting us off an hour early Christmas Eve—without pay, of course. We weren't paid for Christmas either, come to think of it.

Tough Connection

GE MEN at Hanford, Wash, reactor plant recently had to connect two vertical pipes in a radioactive area. To get connector length, this was the procedure:

A photographer in the heavily shielded windowless control cab of an overhead crane took a picture of the pipe ends through a periscope. Division of known pipe diameter by apparent diameter on the photo gave the picture's scale factor. Distance between pipe images multiplied by the scale factor gave the true horizontal distance between the pipes. Next, a tape measure was lowered from the crane so it hung vertically between the two upright pipes. Then a surveyors' transit was carried to within 150 ft of the units. Even at this distance the rays were so strong no worker could stay there over three minutes a day. One man brought in the transit, aimed it at the pipes and quickly withdrew. A second man entered, focused the telescope and jotted down two readings corresponding to the points where the tape passed the pipe ends. A third duplicated these readings as a check. With vertical and horizontal distances between the pipe ends now known, fabrication began on the connecting tube. Shortly thereafter, the crane lowered the connector into place. It fitted perfectly.

Bidding by Automation

HIGH-SPEED electronic computers have been developed by the National Bureau of Standards for use of purchasing agencies of the Dept of Defense. They make it possible to analyze bids to attain lowest net cost for each item, considering freight rates, quantity, and other factors. The answer to the most complex problem is given in about two hours. Actually, the job is done by comparing other bids with one chosen as a standard . . . This is another of the developments in the new field of linear programming.

Room Service

DURALOY CO, Scottdale, Penna, has purchased three hotels. Many companies have, in recent years, invested in motels or local hotels to be assured of adequate rooms for customers, but the peculiarity in this case is that the hotels are in *Florida* and total about 600 rooms. Object is to avoid cyclical variations characteristic of the alloy-casting industry, and the three hotels are expected to earn about as much as the base company.

Ergonomics

OUR TITLE is the new word for human engineering—the study of men at work. Prof Theo F Hatch, University of Pittsburgh, suggests engineers should be more conscious of this factor in designing new machines and in making new production setups. The modern worker makes only a small part of the product, so loses the feeling of accomplishment that characterized the hand craftsman. To avoid difficulties on this score, engineers should work with anthropologists, anatomists, physiologists and psychologists, he suggests, and offers a new phrase to describe the problem: "psychophysiological fatigue." We get it from the phrase itself; why not "boredom," which is very familiar and easier to understand?

STATE OF THE UNION: Production

"Maximum use of science and technology to minimize numbers in men" — that's defense thinking today as outlined by President Eisenhower in his State of the Union message. It means more planes, more atomic weapons, more guided missiles — and it means new tasks for Metalworking

WASHINGTON—President Eisenhower's message on the State of the Union spelled out the administration's defense policy—to keep up an "effective retaliatory force as the principal deterrent to overt aggression." This means more emphasis on airpower, atomic weapons, and guided missiles, less emphasis on traditional ground forces, to "fit . . . the military realities of our time."

The transition to a peacetime economy is "largely behind us," the President said, and "the economic outlook is good." He said a hike in annual national output from $360 billion to $500 billion is attainable within 10 years "if we as a people act wisely."

The President asked Congress to:

- Liberalize foreign trade policy. He wants a three-year extension of the reciprocal trade program, power to cut tariffs 15% over this period and to set a 50% ad valorem ceiling on import taxes. He wants to increase the flow of US private capital to foreign underdeveloped regions by cutting taxes on corporate income earned overseas.
- Extend the Selective Service Act and provide more incentive like better housing and higher pay to spur reenlistments in the Armed Forces. In addition, he seeks a comprehensive reserve force.
- Extend for two years the Defense Production Act. This means power to maintain and expand the mobilization base, to allocate materials, and standby wage-price controls.
- Continue the 52% Corporate Income Tax, now slated to drop to 47% in April. Said the President: "Defense and other essential government costs must remain at a level precluding further tax reductions this year . . . further tax cuts will be possible when justified by lower expenditures and by revenue increases arising from the nation's economic growth." He said such reductions can be made next year.
- Extend the Small Business Administration's authority. The agency's lending activity has perked up in recent months, is expected to step up even more later this year.
- Amend the Taft-Hartley Act by giving economic strikers the right to vote in representation elections.

Telescribers Cut Production

Line shortages . . .

ON-THE-SPOT OPERATOR in the F-89D fuselage assembly section at the Hawthorne plant reports a line shortage by Tel-Autograph to Central Control

. . . are relayed by Central Control to outlying plant stations . . .

THIS IS THE HEART OF THE SYSTEM, where operators keep continual tab on plant delays and shortages. Telescribers (center) receive and send messages to outlying stations. At left on board are master record cards showing matters needing corrective action. Duplicate cards are kept by senders and receivers

Is Today's First Line of Defense

● Increase minimum wages from 75¢ to 90¢ an hour, and extend the law's coverage, probably to workers in wholesale and retail trades.

In the field of social welfare, President Eisenhower proposed a variety of measures: more public housing, federal aid to education, aid to low-income farmers.

Major controversies are brewing for two of the president's main proposals. First, there will be considerable opposition to his plan to renew the present corporate tax rates.

Then, the administrations' military program is certain for some heated debate. Congressmen have already condemned Defense Secretary Wilson's earlier announcement that the military budget would provide for sharp cuts in Army and Navy manpower.

The administration plans to cut the active military forces from about 3.2 million men to 2.8 million within 18 months. Its Reserve Program provides for maintenance of a combat-ready reserve of about 3 million troops, with six-month training courses for 100,000 youths a year.

In his message, the President emphasized that the military policy was "prepared under my personal direction." The implication is clear. Congressional critics of administration policy have only the Soldier in the White House to blame if they consider the new proposals inadequate to national defense.

The day before the President's message on the State of the Union, the White House released an exchange of correspondence between Defense Secretary Wilson and Eisenhower, spelling out the President's personal views on military policy.

Eisenhower pointed out four considerations for military preparations:

● The threat to US security is a "continuing and many-sided one—there is, so far as we can determine, no single critical 'danger date' and no single form of enemy action to which we could soundly gear all our defense preparations."

● Real national security is based on a strong and expanding economy that can be quickly converted to war production.

● Security should be based on maximum use of science and technology "to minimize numbers in men."

● For the first time in its history, the US is vulnerable to direct and sudden military attack.

Based on these considerations, the President said: "Our first objective must therefore be to maintain the capability to deter an enemy from attack and to blunt that attack if it comes—by a combination of effective retaliatory power and a continental defense system of steadily increasing effectiveness. These two tasks logically demand priority in all planning. Thus we will assure that our industrial capacity can continue through a war to produce the gigantic amounts of equipment and supplies required. We can never be defeated so long as our relative superiority in productive capacity is sustained."

Bottlenecks at Northrop Aircraft

. . . while bookkeeping machines record transactions

KEYED TO THE TELAUTOGRAPH SYSTEM is a battery of eight bookkeeping machines that automatically record all transactions handled by the records section of Northrop's production ordering department. All records for the F-89D are posted by these machines

FIRST AIRCRAFT ADAPTATION OF HANDWRITTEN MESSAGE SYSTEM LONG USED IN COMMERCE

HAWTHORNE, CALIF — TelAutograph, a system commonly used to transmit handwritten messages in hotels, banks, stores and other commercial institutions, is being used by Northrop Aircraft here to cut delays in production of the Scorpion F-89D. Sending-receiving units are installed in 37 outlying plant areas to communicate instantly any line troubles or material shortages to a Central Control. The message is then recorded and relayed on to other sections that might be affected. For example, if one section reports a shortage of material, Central Control keeps master records that show instantly if the shortage is plant-wide or only confined to that section. Coordinators and project men at Central Control can take immediate corrective action on any trouble. Correction is expedited by a man assigned to a given section of the plane, from its point of origin until the finished plane.

News of Metalworking . . .

WHAT'S AHEAD IN '55? Another

"Mildly optimistic" is about the best way to describe industry leaders' reactions to what they see in 1955's crystal ball. It won't be a world-beater like 1953, but it'll be better than 1954. And watch out for 1956—it may top them all!

NEW YORK—Business is on the mend and 1955 looks good. That is the consensus of opinion expressed by many associations and companies in various segments of the metalworking industries.

The improvement, which has made itself felt the past few months, is likely to continue. It includes durable-goods producers as well as companies making consumer products. It also applies to raw-materials suppliers—the metals producers.

• **Electrical manufacturing:** The electrical manufacturing industry expects to increase its shipments 5% in 1955 over 1954. Shipments in 1954 amounted to $15.6 billion, compared with the 1953 peak volume of $16.4 billion, National Electrical Manufacturers Association declares. Electric appliances should recuperate much of the loss suffered the past year.

Sharp increases should occur in the newer appliances—dishwashers, food waste disposers, automatic clothes washers, clothes dryers, dehumidifiers, custom-built ranges. Specific sales predictions for 1955 include: 3½ million electric refrigerators; 1 million food freezers; 1¼ million ranges; 800,000 electric water heaters; 1 million room air conditioners; 2½ million automatic clothes washers.

Only one branch of electrical manufacturing—generating, transmission and distribution equipment — will trend downward (an estimated 5%).

• **Television:** Retail sales of 5.8 million monochrome units will represent a reduction from the near-record level in 1954, Dr W R G Baker, vice president General Electric and general manager of the Electronics Division, predicts. This decline will be offset by sales of 200,000 color television sets. Dollar volume in 1955 will be about the same as in 1954.

• **Radio:** Around 6.5 million units will be sold this year. This is a good showing compared with previous years, Dr Baker states, and is an indication that radio has been making a satisfactory adjustment to the expansion of television. Nearly 1 million of the new radio sets will use printed wiring. Total sales of mobile radio equipment will be 10% above 1954, with more and more manufacturers using two-way radio as a valuable cost-reduction tool in their plants.

• **Electronics:** First quantity production of general-purpose transistors will occur in 1955. Increased use of electronic tubes for defense industry and entertainment will give added impetus to the already rapid growth in the tube business. Long-range prospects for production of military electronics equipment appear good.

• **Air Conditioning:** A continuing gain in sales is looked for by Cloud Wampler, president Carrier Corp. Total business at retail set a new record of $2 billion in 1954, compared with $1.7 billion the previous year. Year-round air conditioning for homes and large central systems for office buildings have been the biggest growth area. "Air conditioning of industrial plants should begin in 1955 to show its truly great potential, which long-range seems second only to that of homes," Mr Wampler says.

• **Steel:** 1955 steel ingot production should be at least 95-million tons, 7 million more than last year, Benjamin F Fairless, US Steel board chairman, states. This means that 1955 will be a good year for nearly all segments of business. Mr Fairless cited soft drink canning as an example of applying an existing material to a new use—some 75,000 tons of tin plate was thus consumed in 1954, with use expected to double this year. Another harbinger: Inland Steel has increased its steelmaking capacity 1.6-million tons since 1950, half of the gain coming from enlarging existing facilities, and improving methods of production.

• **Copper and brass:** Copper & Brass Warehouse Association reports 19% better fourth quarter sales in 1954 than in the same period of 1953: says first quarter 1955 volume promises to be far ahead of last year's.

• **Zinc die castings:** Usage for both functional and decorative trim parts on appliances and automobiles has greatly increased since May of 1954, the American Zinc Association reports. Reasons: (1) completion of a transition back to peacetime operations in user industries, (2) sharp competition in consumer goods — making appearance more important.

• **Commercial heat treating:** some of the 25% loss in commercial heat treating sales sustained in first half 1954 has been made up and a steady gain in volume is expected this year, C M Cook, president Metal Treating Institute, declares. Many users who have operated their own facilities, regardless of cost, are now going outside with their work. New industry developments: hard-surfacing treatments for aluminum; new coatings for iron and steel; new, more easily heat-treatable titanium alloys; greater demand for controlled atmospheres; faster processing equipment.

• **Automation and controls:** sharper competition is driving industry toward more automatic operation, acording to Henry F Dever, president of Minneapolis-Honeywell's Brown Instruments Division. This, he says, offers the "most challenging opportunity since the beginning of mass production," and it is apparent that industry has realized only 10-15% of the potential applications of automatic control. Overall sales for the automatic controls industry can range anywhere from 5% below 1954's total to all-time records. The issue, he says, will be decided by the quality of product lines and aggressive sales. More and more industries will take up automation as time goes on, Mr Dever thinks, sparked by the growth industries of tomorrow.

• **Agricultural machinery:** leading producers think the downward sales trend has ended, but another drop in farm income could adversely affect sales.

• **Aircraft:** with 96% of industry output going to the military, the Air Force program of 137 wings will keep the industry going at high

"Good" Year Is Industry Consensus

levels for at least two years. Offshore buying by at least one domestic airline will cut industry revenue $40 million in 1955, however.

• **Aluminum:** shipments for civilian use will set another new record in 1955, with total 1955 consumption set at 3.2 billion lb.

• **Autos and trucks:** A minimum output of 5.75 million passenger cars is estimated for 1955, compared with 1954's 5.5 million. The new year should also see production of 1 million commercial trucks, 46,000 truck trailers. This would make 1955 the third best year in auto history.

"Very Good" Says Weeks

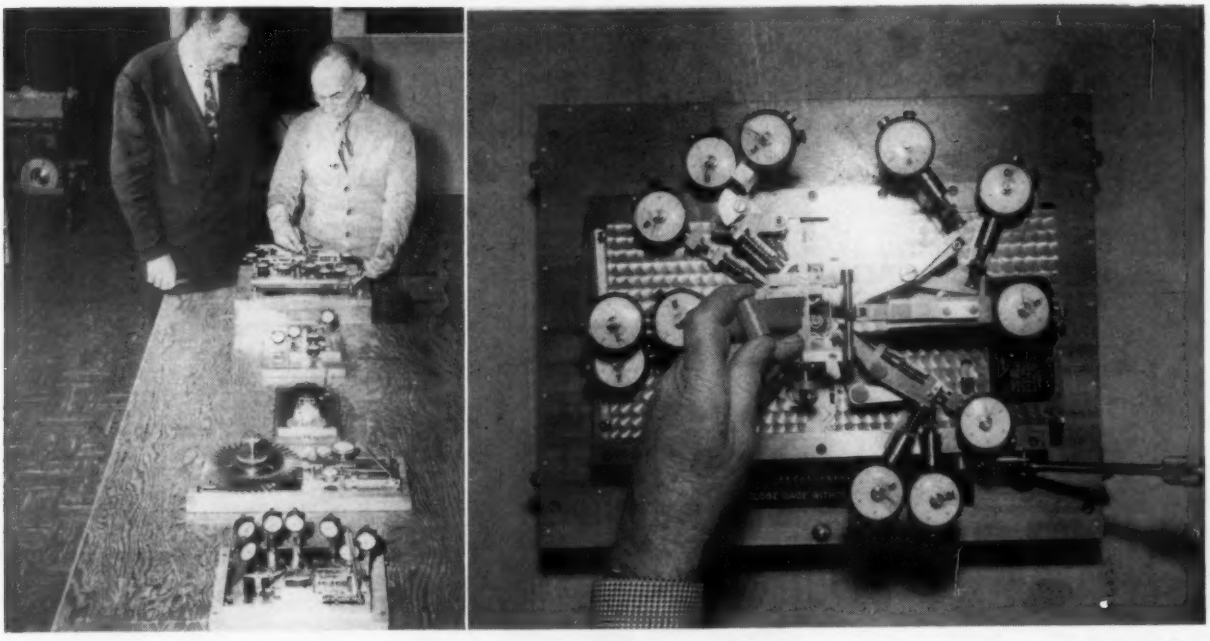
Secretary of Commerce Sinclair Weeks sees the outlook for 1955 as "very good" because: (1) industrial production picked up 4% in fourth quarter 1954 and is continuing on the upgrade, (2) employment has picked up considerably since last summer's low, (3) 1955 will start with a continued high rate of outlay for new plant and equipment, although it will drop off during the year, (4) the construction industry will get away to a fast start in 1955 and will carry many other industries along with it, and (5) the population is growing fast, will need more and more goods and services every year, and the standard of living is growing with it.

ASTE to Investigate Metal Cutting

DETROIT — Can basic theories of metal cutting be developed? American Society of Tool Engineers' Research Fund Committee plans to find out in the hope that machinability investigations can either be rendered unnecessary or drastically reduced in scope through knowledge of proven principles of metal cutting.

ASTE's Committee plans to find out, if it can: (1) why specific metallurgical structures cut the way they do, (2) why free machining metals behave as they do, and (3) how each variable affects the end result. The answers will be passed on to producers of tool steel, cutting tools, machine tools, basic metals and cutting fluids to help them turn out better products. Actual work is underway on the project, based on a preliminary plan of action. Existing information sources, published or unpublished, are being investigated, evaluated and collated.

Researchers and organizations in these fields will be invited to cooperate.



Turbine Blade Inspection in 5 Minutes!

SPECIAL CHECKING GAGES have cut turbine blade inspection time from 8 hrs to 5 min at Boeing Seattle, where they are used to check tolerances of less than 0.002 in. in the 44 to 66 1½ in. long blades that make up the wheel of Boeing's small gas turbine. There are several different types of checking gages employed (left) but all work on the same principle as the one shown at right. The gages have up to 13 metal "fingers" mounted on springs and extending from the open end of a cylinder, putting pressure against the spring. Other end of finger is linked to a dial indicator. Master blade is placed in gage. Fingers are brought into contact with it at selected points; reading is then made on dial. Dial needles are reset at zero and new blade is placed in gage. Indicator dial needles immediately show any variation from the master blade

ASTE'S 23rd ANNUAL MEETING:

Five Days of Technology Will Bolster Western Tool Show

Technical program at Los Angeles will cover drawing board codes and top management problems — and almost everything between

LOS ANGELES — More than 40 top engineers and production men are slated to speak on tooling technology and production problems at the 23rd Annual Meeting of the American Society of Tool Engineers, to be held at the Shrine Auditorium here March 14-18 in conjunction with the first ASTE Western Industrial Exposition. Daytime technical sessions will be held at the Auditorium, evening sessions at the Ambassador Hotel.

Daily General Topics

The five-day technical program will be divided into general topics for each day: Monday, March 14, Professional Developments; Tuesday, March 15, Pressworking; Wednesday, March 16, Management; Thursday, March 17, Processes; and Friday, March 18, Precision Control.

The Highlights

March 14 topics will include magnesium for fixtures, industrial numbering codes, and tool engineering research.

March 15 sessions will cover plastic tooling for production, presswork tools and methods, leasing of production equipment and automation goals.

March 16 sessions will discuss preparing engineers for manufacturing responsibilities, in-plant engineer training for large and small organizations, gears and splines, general-purpose vs special-purpose machines, and coordination of manufacturing management.

March 17 agenda includes discussion of tooling for non-ferrous, high-temperature precision products, and shells and extruded products. No evening session is scheduled because the Society will hold its Annual Banquet and installation of officers at the Coconut Grove.

Ex-US Senator Prentiss Brown will be the banquet speaker.

March 18 sessions will cover quality control through realistic tolerances and ferrous and non-ferrous heat treatment.

Southern California section, Society of Plastics Engineers, will co-sponsor the March 15 session on plastic tooling for production, and the Los Angeles chapter of the American Society for Quality Control will co-sponsor a March 18 session on quality control.

JIG ANGLE FORMING:

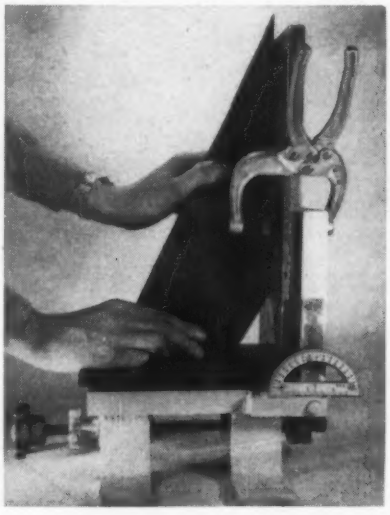
Weld-and-Check Fixture Saves 5 Manhours per Jig

DALLAS—A weld and check fixture is saving an average of five manhours per jig at Temco Aircraft Corp here by simplifying the positioning and welding of open and closed angles and gussets. As many as 2000 angles are used in a single jig at Temco where tooling is underway on B-52 fuselage sections.

Sides of the angles range up to 22 in. long—almost twice the length of the standard stock angle. Welders formerly held angle sides together by hand while they tacked them with an electric arc. Considerable adjusting and checking with a square was necessary before the final weld and machining.

Less than 4 Hrs to Build

Now, with a fixture built in less than 4 hrs by Temco jig builder W W Keas, angles are true to within 1 degree when ready for machining. This has cut machining time an average of 10 min a unit. The fixture has a back plate and a bed plate, each made of 10 x 10-in. pieces of 1-in. cold rolled steel. Four feet, welded to the bed plate are 3 x 3 x 2½-in. angles. Plates are joined by two 1 x 1 x 3-in. hinges, welded to the bed plate and joined to the back plate by two ½ x 1½-in. dowels, allowing the angle formed by the back and bed plates to be opened and closed. Closure is regulated by a ½ x 13-in. threaded bolt that runs horizontally through a block welded to the bottom of the bed plate, and through a swivel block secured by dowels to the bottom edge of the back plate. Two star nuts are attached to the front end of the bolt.



Operator turns one nut to tilt the back plate to form any angle from 30 to 180 degrees; and turns the other to lock the back plate at the desired angle. Setting up the fixture takes less than 1 min: tacking the angle is almost as simple. One angle side is placed horizontally on the bed plate. The other is placed upright, flush against the back plate. Both sides are secured to their plates with C-clamps.

Angle is established by turning the star nut until an indicator on one edge of the back plate is opposite the desired degree mark on a protractor mounted atop one hinge. Fixture is then locked with the other star nut, gusset is placed in position and tacked, and angle sides are tacked together. C-clamps are then loosened, and angle is removed for final gas or electrical weld.

STARRETT CELEBRATES DIAMOND JUBILEE

ATHOL, MASS—L S Starrett Co will observe its 75th anniversary here this year. Three-quarters of a century ago, Laroy S Starrett invented and manufactured the combination square—a tool that is still a basic item in a mechanic's kit. That started the growth of L S Starrett Co from a room in a small machine shop to what is believed to be the world's largest manufacturing plant devoted exclusively to the production of mechanic's hand-measuring tools and precision instruments, numbering more than 3000 separate items.

Work Force Up to 2500

The original handful of craftsmen has become a work force of anywhere from 1500 to 2500 employed in making micrometers, steel rules, dial indicators and gages, bandsaws, band knives and precision-ground die and flat stock.

The firm's founder, L S Starrett was responsible for more than 100 patents in the precision metalworking tool field.

Starrett will celebrate its anniversary with announcement of several new tools, and a new catalog.

D M PATTISON ACQUIRES ALMOND CHUCK ASSETS

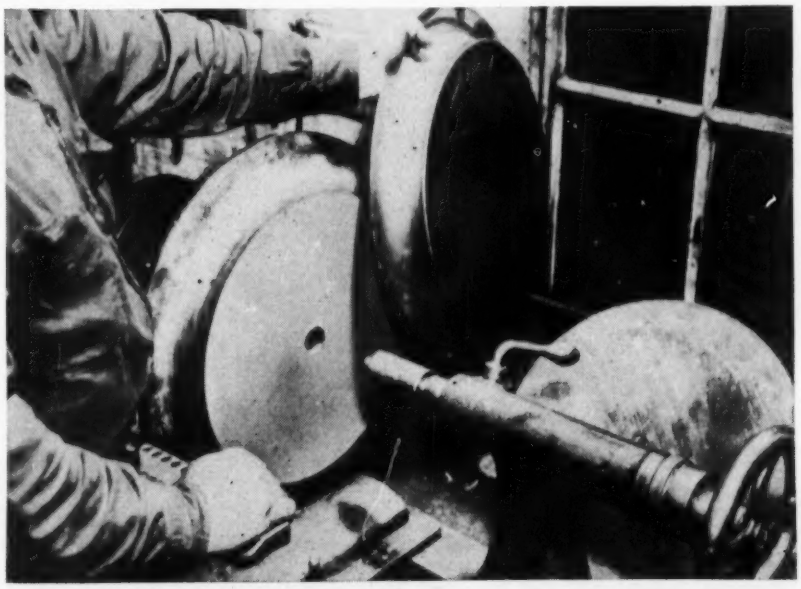
ASHBURNHAM, MASS—Certain assets and the name of the 82-year-old T R Almond Co of this city have been taken over by Donald M Pattison, formerly vice president sales and a director of Warner & Swasey Co. Under Mr Pattison's direction, a new company, as yet unnamed, will manufacture the drill chucks, independent lathe chucks, and three-jaw geared scrolls formerly made by Almond, in a new one-story plant at Willoughby, Ohio, a suburb of Cleveland.

Veteran Management

Works manager of the new firm will be Irving T Knott, formerly superintendent of two leading Cleveland tool shops. Directors are: Mr Pattison, E B Gausby, secretary of Warner & Swasey; Albert Ray, president, Gahr Machine Co; Stanley A Woleben, vice president, Armstrong-Blum Mfg Co; and C M French, president of Great Lakes Box Co. Mr Pattison is president, as well as a director, of the new company.

Spinning Chucks, Gluing Jigs and Stretch Forms Made from New Paper-Plastic Laminate

LAMINATED SPINNING CHUCK forms a precision weather instrument, can . . .



SPIN A 17-GAGE COLD-ROLLED STEEL ventilating ring with inside flange 19½ in. dia for naval vessels

NEW YORK — A new laminated die stock made with a paper-base impregnated with Bakelite phenolic resins has been developed by the Formica Co to produce spinning chucks, pattern boards, gluing jigs, stretch forms and hydropress forms for the shaping of ductile metals, plastics, wood and similar materials. The laminate is reported to be strong, economical, easy to machine, and has a smooth surface eight times stronger than hard maple in dent resistance. At Maryland Metal Spinning Co, Baltimore, chucks made of the new die stock are used to spin 0.040 in. thick brass to a tolerance of plus 0.007-in., minus zero, on a dia of 3.409 in., inside overall foleranees: plus 0.005-in. minus zero.

LABOR, MANAGEMENT AND EISENHOWER:

The Eisenhower labor package for this year has small gifts for labor and small gifts for management — and nothing much for anyone. But keep an eye on the NLRB. That's where battle will be joined when the Democrats start sniping at NLRB's Republican-majority decisions

WASHINGTON — In the weeks ahead, the Eisenhower administration will detail a labor legislation program for Congress that falls just about halfway between what labor wants and what management wants — and the program will probably be about halfway successful.

The Eisenhower labor package includes amendments to the Taft-Hartley Law, a minimum wage increase, improvements in other federal labor legislation, and some recommendations to the states to improve their labor laws. The administration will most likely repeat most of the Taft-Hartley proposals of last year — which made no headway — and the same outcome is anticipated this time.

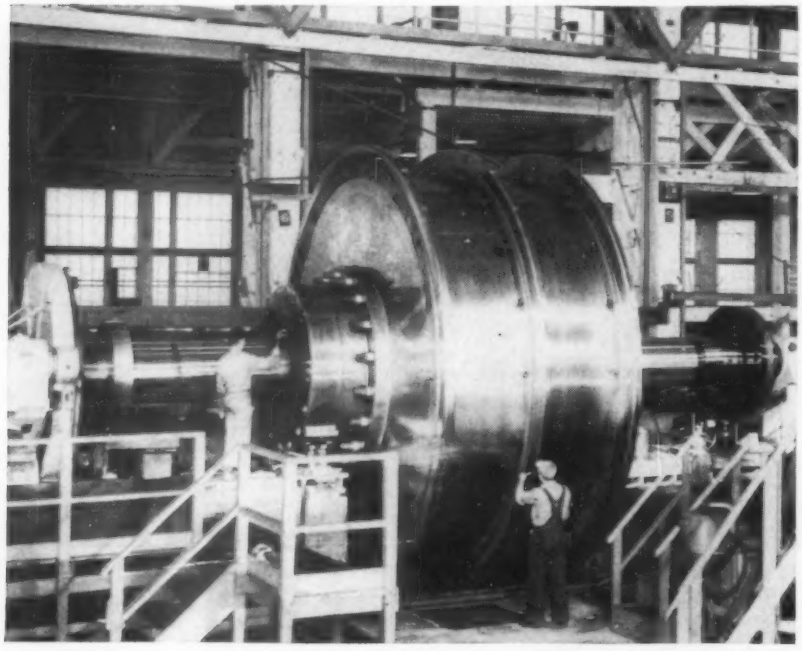
On the minimum wage, the administration's plan for a 15¢ boost of the current 75¢ minimum will probably go through, but any efforts to add presently exempted industries, such as retail trade and service groups, will face a tough fight.

Minor Changes Only

While the scope of the program is extensive, the proposed changes are comparatively minor. Some will pass because the changes are minimum: others will be denied because they are too small to evoke enthusiasm from either conservative or liberal lawmakers to alter the record books.

Vocal Fireworks Due

Where the White House program fails to dovetail with the opinion of labor and management "professionals," it will provoke bursts of criticism. This will be picked up by Congressmen in oratorical challenges—



Big Rotor for the "Big Wind"

LARGEST OF ITS TYPE EVER BUILT, this 18-ft-dia rotor will blow up transonic gales when windmill-like blades are attached and four giant motors with a combined horsepower of 216,000 spin it at the US Air Force's wind tunnel at Tullahoma, Tenn. Constructed at Westinghouse Electric Corp's Sunnyvale, Calif, plant, the 130-ton rotor is made up of three huge disks and six other pieces, all bolted together to clearances within 0.004 in. When the 1200-lb blades are added, the rotor assembly will be 30-ft in dia, and will weigh 180 tons

DOW RENEWS VELASCO MAGNESIUM PLANT LEASE

VELASCO, TEXAS—Dow Chemical Co has renewed its lease on the world's largest magnesium plant here for three years — ending a three-months' squabble over the plant's future. Dow has operated the Velasco plant for almost five years. Its most recent lease expired October 31, but Dow had a renewal option. Some weeks before the expiration, Dow tried to buy the plant for $13.5 million from General Services Administration.

GSA jumped at Dow's offer, but the Justice Dept put its foot down, claiming sale to Dow, the sole commercial magnesium producer, would "tend to maintain a situation inconsistent with the anti-trust laws." Justice suggested that GSA sell Velasco to another firm.

Dow's lease was then extended until January 31, 1954, to allow time for the government to settle the plant's future status. In recent weeks, Dow had decided its purchase prospects were just about nil. At the same time, GSA was getting nowhere in its attempt to sell Velasco to someone else. So Dow took up its option to renew the plant lease, plans to run the 44,000-ton plant at 50% capacity in 1955.

It's "Middle of the Road" for '55

but most of the fireworks are likely to be just vocal.

But there's another labor area that threatens to get the full political treatment this year. It concerns Taft-Hartley — not the technicalities of the law itself — but the federal agency that administers the labor-management act.

Senate Probe Coming Up

The National Labor Relations Board, manned by a Republican majority for the last 18 months, is going to get a going over from the Democratic-controlled Congress. The investigation will center on the Senate Labor Committee, which has an extensive lineup of liberal Democrats, headed by Alabama's Lister Hill.

The probe is suddenly timely because of these three factors:

- Two positions are open at the NLRB and the administration's candidates for the posts will be reviewed by the Senate labor group. Both are critical jobs — the general counsel, who has the sole authority to process charges of unfair labor practices — and a fifth board member who will sit between two GOP appointees and two Democratic holdovers.
- The Board recently completed a series of important decisions, many overturning policies set up by the agency when it was under Democratic administration. Many of its rulings were split along party lines, with the members, who decide the cases under Taft-Hartley rules, viewing the law with distinctly different ideas. These policy reversals will be investigated by Congress.
- The general counsel vacancy has blocked the Board from taking unfair labor practice cases — its most important function. The urgency for filling the post will bring the whole NLRB issue to a head on Capitol Hill.

NLRB Marking Time

For the last few weeks, since the expiration of George J Bott's term as counsel, the Board has been restricted to processing representation elections. Violations of Taft-Hartley have been held up at the counsel's office, since only he is authorized to press complaints before the agency. Board operations have also been slowed down because of the departure of member Albert C Beeson a month ago.

Key Candidates

President Eisenhower's choices for both posts will probably face a tough time on Capitol Hill, but if the current front-runners for the positions are finally nominated, the chances are they'll be approved. Slated for the general counsel's job is Chicago attorney Theophil C Kammholz, who was first proposed during the last session, but no action was taken. In line for the member's position at the moment is Dwyer Shugure, former administrative assistant to Sen Irving Ives of New York, though this isn't definite.

Both choices are attorneys whose firms represent industry. This in itself is enough to bring them under fire of union leaders, even though neither is labeled a conservative. In fact, some management men have expressed opposition because of this factor.

Pro-Management Decisions?

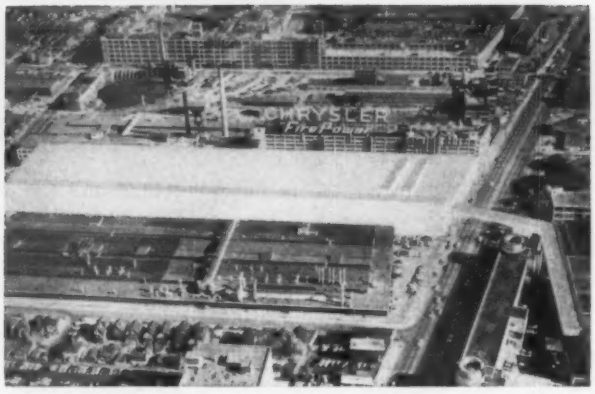
The nominations will open the way for the Senate Labor Committee to peruse the Board's activities under the Eisenhower administration. For the most part, NLRB decisions have been bitterly attacked by unions as favoring management. These decisions range from new jurisdictional yardsticks, to an ease-up in employer free speech in discussing unions with employees. Some of these rulings came with a 3-2 Republican majority, but most Board cases were decided either unanimously, or by non-party-line alliances. Nevertheless, organized labor will be pressing for a complete investigation and Senate Democrats have promised to see they get it.

Xmas Ornaments Aid Planemaker

CHRISTMAS TREE ORNAMENTS ARE SAVING A LOT OF MONEY in the building of aircraft structures at Boeing Seattle, where they are used to decrease the weight of foamed-plastic fillers that are employed as a stiffening material between sheets of metal. One of the chief bugaboos of the aircraft designer is weight and the ornaments make excellent and cheap ($2 a gross wholesale) cores for lightening holes. Ornaments are nitric-acid dipped to remove their silvery coating so they won't bond to the poured plastic. Before discovering ornaments, Boeing tried hollow aluminum balls and tetrahedra made of paper

A new foundry for Bullard . . .

will cost $6 million and will be New England's most modern gray iron foundry — 600 ft long, 245 ft wide, 50 ft high, adjacent to Bullard's machine tool plant in Bridgeport, Conn



. . . and a new plant for Chrysler

. . . that will be located on East Jefferson Ave in Detroit. Scheduled for June 1 completion, it will have a 14-mile-long continuous conveyor system, an automatic painting setup, automation all over the place: will up Chrysler output 40%

Companies in the News . . .

GM's New Departure Division plans a Machine Tool Ball Bearing Conference at the Statler, Hartford, Conn, Feb 15-16, with New Departure engineers meeting with machine tool builders to iron out design and engineering problems.

National Cash Register Co will spend $16 million on expansion this year for: a $4-million engineering and research building, $6 million worth of new tooling, and $6 million for capital goods.

Cadillac's Cleveland Tank Plant recently wound up output of the Walker Bulldog light tank and M-42 twin-gun carrier—will continue to make 40-mm gun carriers. The plant, whose personnel has been cut to 2193 from a high of 6800, will continue as a tank research center and expects new contracts to bolster its output.

Continental Aviation & Engineering has taken over the former **A O Smith** plant at Toledo, now government owned, and will make jet engines and portable generators. The Continental Motors subsidiary will use some existing tools, plus considerable retooling.

Three Chicago manufacturers are aiming for control of Thor Corp by buying out individual shareholders in the Chicago appliance firm, whose profits dropped off sharply last year. The buyers: Victor Nemeroff of H & B American Machine Co, Arnold H Maremont of Maremont Automotive Products Inc, and David Bright of Electro Mfg Co.

Seneca Falls Machine Co is constructing an addition to its main plant at Seneca Falls, N Y, to house its new Electronics Division, and its engineering department.

Consolidated Machine Tool Corp, Rochester, N Y subsidiary of **Farrel-Birmingham Co Inc,** has been dissolved as a separate corporation and will become a division of F-B.

Blaw-Knox Co, Pittsburgh, plans a multi-million-dollar, long-range expansion program to include consolidation of three road-building equipment plants into one at Mattoon, Ill, and consolidation of dairy equipment production into its Mora, Minn, plant.

Makers of big automatic coalmining machines have informally proposed that Washington stockpile that equipment as a defense measure — a sort of Vance Plan for coalmining equipment.

Intercontinental Machine Corp, a new firm formed by Paul Ward Brody of Los Angeles, has bought the Seele Punch Press Division of Pacific Tool & Die Co and will manufacture 35- and 70-ton punch presses. The company will headquarter in Los Angeles and have offices in Berlin and Buenos Aires.

Merritt-Chapman & Scott Corp (Louis E Wolfson of Montgomery-Ward fame) plans to acquire **New York Shipbuilding Corp.**

U S Industries Inc, New York, has acquired the plant and assets of **Fray Machine Tool Co,** Burbank, Calif, manufacturers of milling machines and accessories, and will move the Fray operation to its Axelson Mfg Co Division's Vernon plant at Los Angeles.

Baldwin-Lima-Hamilton Corp is negotiating for purchase of Hydropress Inc and its subsidiary, Loewy Construction Co, makers of hydraulic presses.

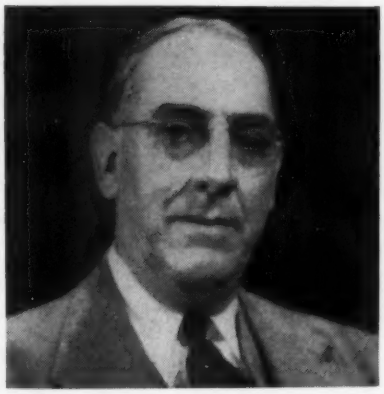
Thompson Products Inc, Cleveland, will spend about $11 million for new tools and tooling in 1955. Objective: deeper penetration into electronics and aircraft equipment production fields.

Air Force's Middletown Air Materiel Area's Industrial Liaison Office has been relocated 111 E 16th St, New York 3, N Y.

E W Bliss Co, Canton, Ohio, makers of presses, die sets and supplies, rolling mills and equipment, has opened a California sales office at 816 N Hollywood Way, Burbank.

Fairchild Camera & Instrument Corp of Syosset, N Y, plans to build a 48,000-sq-ft plant in Los Angeles to house its expanded Fairchild Potentiometer Division, and part of its Industries Division.

Lunn Laminates Inc has acquired **Uber Tool & Mfg Co,** Detroit tool and die manufacturers, will operate it as a subsidiary.



NILES-BEMENT-POND ELECTS . . . **John C Molinar** (left), manager of domestic cutting tool and gage sales, to vice president and general sales manager (domestic and foreign); and **James D Allan,** manager of Pratt & Whitney Division's domestic machinery sales, to direct machinery sales of all N-B-P divisions

Howard Murray, head of Philadelphia Gear Works' Houston office, has been named general manager of sales

Names in the News . . .

GISHOLT MACHINE CO, Madison, Wis, announces the retirement of: **Alfred B Morey,** vice president and treasurer (41 years' service); **F M Long,** director of foreign sales (48 years); **C K Swafford,** vice president (42 years), to retire February 28; **U S James,** Detroit sales manager (42 years); and **Harold Earl,** Moline, Iowa, sales manager (30 years). New appointments and elections: **H A Waddell,** treasurer; **Arthur B Morey,** assistant treasurer; and **A G Hoffer,** general plant superintendent, to works manager as of February 28; **E K Baxter** to head the Detroit office; **Robert Wellman** to manage the Moline office.

STUDEBAKER-PACKARD has announced two newly-created corporation assignments: **Neill S Brown,** manufacturing manager of Packard's car division, to general manufacturing manager—body and assembly group; **Earl M Douglas,** in charge of all Studebaker manufacturing activities, to general manufacturing manager—foundry, engine and transmission group.

C A NORGREN CO, Englewood, Colo, has created three new top management posts in the organization. **C Neil Norgren,** vice president and assistant general manager, to executive vice president; **Leigh H Norgren,** assistant to the vice president, to vice president in charge of engineering and production; **Delbert G Faust,** chief engineer, to vice president in charge of sales and advertising. **J A Wilson,** assistant chief engineer, succeeds Mr Faust. **George L King** has been named treasurer.

WILTON TOOL MFG CO, Chicago, has promoted **Alex J Vogl,** sales manager, to vice president for sales. **William J Ferrick,** assistant sales manager, succeeds him.

CHRYSLER AIRTEMP DIVISION, Dayton, Ohio, has promoted **P W Wyckoff,** assistant chief engineer, to chief engineer. Appointed to newly-created posts are: **R L Brugler,** product engineer in charge of air-conditioning unit design, to assistant chief engineer in charge of design operations; **R W Kelto,** laboratory supervisor, to assistant chief engineer in charge of laboratory operations.

RESISTANCE WELDER MANUFACTURERS' ASSOCIATION has elected **J C Wilson, Jr,** head of Acro Welder Manufacturing Co, Milwaukee, president of the Association. **David V Uihlein** of Banner Manufacturing Co, Milwaukee, has been named vice president.

BABCOCK & WILCOX CO has appointed **Sidley O Evans,** superintendent of the extrusion department, to the post of manager of tubing operations at the Tubular Products Division plant in Beaver Falls, Pa. **David A Edgecomb,** assistant superintendent, succeeds him.

Andrew R Wardrop, assistant general manager Stamping Division, has been named general manager of Ford Motor Co's Dearborn General Manufacturing Division.

Col P L Houser, who has been general supervisor of manufacturing standards research for International Harvester Co, succeeds **Mason Britton** as president of the Metal Cutting Tool Institute. Mr Britton has been elected vice chairman of the Institute. **George F Holland,** president, Union Twist Drill Co, has been elected chairman of the Institute's Board.

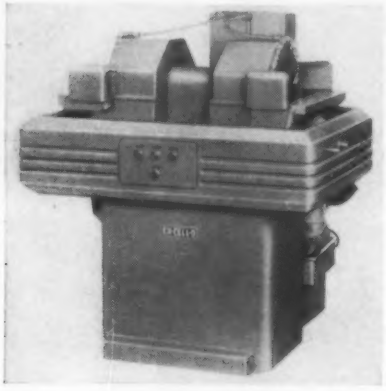
STEWART-WARNER CORP, Chicago, has appointed **Leo J Kevitt,** Ford Motor Co executive, manager of manufacturing of Alemite lubrication equipment and S-W instrument division. **Edward G Wicklatz,** chief engineer, Alemite products, has been named manager of Alemite and instrument engineering.

OBITUARIES

E Franklin Motch, 46, president and treasurer of the Motch & Merryweather Machine Co, Cleveland, died January 6. Son of one of the firm's founders, he had been its president since 1953.

Lionel S Marks, 83, authority on engine design and development, died January 6. The former Harvard professor was author of *Mechanical Engineer's Handbook.*

New Shop Equipment,



Ex-Cell-O Tool Grinders

Two new tool grinders, one using 6-in. wheels, the other, illustrated, using 14-in. wheels, are double-end models with reversible motors, adjustable toolrest tables, and suitable for sharpening all types of tool materials.

Style 46-D is a general-purpose grinder with 6-in. plate-type wheels for face grinding. It has an inbuilt motor spindle permanently lubricated, and coolant flows by gravity from reservoir above spindle.

Style 49-A is a heavy-duty model using 14-in. wheels for fast sharpening of large tools and for rough-grinding smaller sizes. It is supplied with pressure coolant system with individual control valves at each side of each wheel. Coolant settling tank has been added.

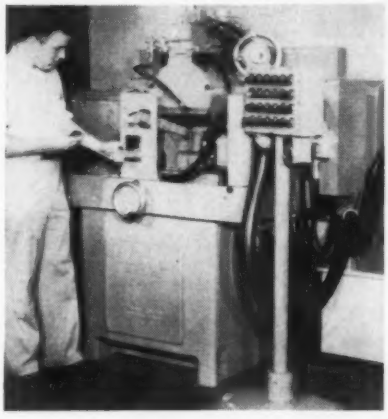
Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich

Vertical Milling Machine Has Three Power Down Feeds

High-speed vertical milling machine incorporates three rates of power down feed to the spindle and optional power feed to the table with infinitely variable speeds. It has six spindle speeds from 220 to 2300 rpm. Power down feed rates are 0.0017, 0.003, and 0.0053 ipr. Full range of manual feed is provided.

Machine has rugged 4¼-in.-dia quill; standard spindle taper is No. 40NS. Longitudinal feed is 21 in.; cross feed, 10 in.; vertical knee travel, 14 in.; vertical spindle travel, 4 in. Standard table is 9x36 in.

Jackson Machine & Tool Co, Palmer, Mich



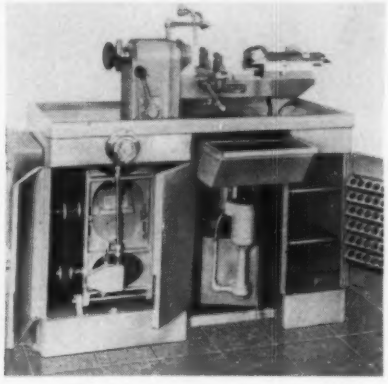
Special Automatic Grinder Developed by DoAll

DoAll rotor grinder utilizes basic DoAll design, but incorporates automatic fixturing to handle parts. Rotors are used in vane pumps for automotive power steering and power braking. Twelve slots in the rotor hold the vanes. Rotors are manufactured of oil-hardening tool steel and prior to grinding, slots are milled, rotor is hardened to 61-62 R_c, and rotor faces are lapped. Slots then finished on the grinder are held to 0.078 in. +0.0005, —0.0000 in. with resulting surface finish of 5 to 10 mu-in.

Rotors are hopper-fed to grinding wheel and each slot is indexed and located so center is aligned under center of wheel face. An automatic unit dresses the wheel after the 12 slots of each rotor have been ground, and lowers column to compensate for wheel depth lost in dressing. Up to 1000 slots are ground per hour.

Lubrication is automatic in both grinding and dressing operations. A 5-hp motor drives the grinding wheel; a 1½-hp. motor supplies hydraulic power for loading, indexing, and ejecting.

The DoAll Co, 254 North Laurel Ave, Des Plaines, Ill



Hand Screw Machine Features New Drive

The Wade No. 73 hand screw machine permits reversing the spindle shaft without reversing motor direction. The gearbox drive has a new clutch arrangement providing mechanical reversing. Helical gears in constant mesh, together with clutch yoke and variable-pitch drive pulley, comprise basic features.

A positive drive timing belt replaces the V-belts previously used. The variable-pitch pulley on the motor shaft provides stepless speed control through worm and worm gear operated by handwheel throughout 100 to 3500 rpm range. Spindle speeds in the high-low ratio of 5 to 1 are provided by the lever which can also brake the spindle shaft while the motor runs.

Wade Tool Co, Waltham, Mass

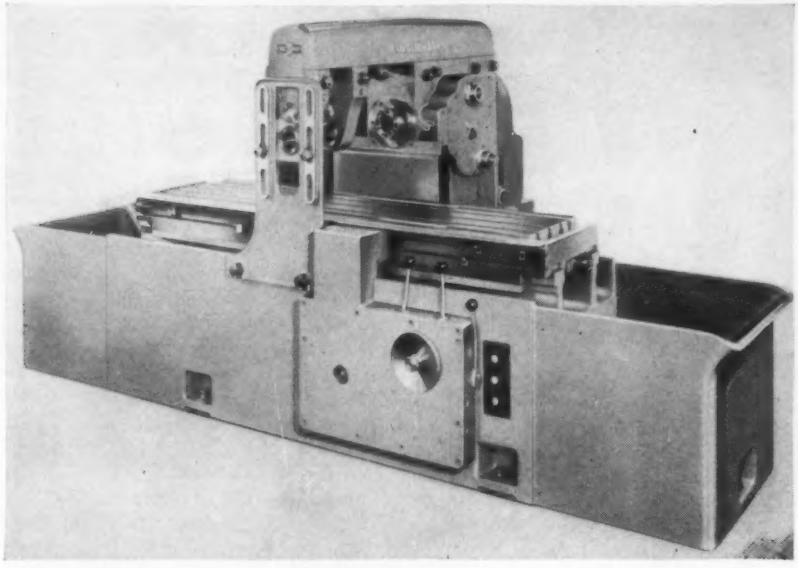
Multi-Channel Recorder Checks Thirty Machines

Thirty-channel recorder monitors motion or activity of any machine or operating device that can be equipped with a switch. Current flowing from device being checked makes continuous mark on sensitive paper; no electricity, no mark. Machine elements are plug-in type, and non-smudge paper allows operation in any location. Unit will monitor 30 different machines at same time.

Alden Electronic & Impulse Recording Equipment Co, Westboro, Mass

Six Bliss "Reduced Press Line" Features

Materials and Parts . . .



HyPowermatics— More Rugged Bed Millers

Heavier, more powerful than older models: Cincinnati bed millers are rated at up to 5 hp and with spindle speeds to 2000 rpm. Machines are bed type, equipped with two-way table-feed cycles and infinitely variable feed rates.

Plain and duplex styles are built in three series, 300, 400 and 500, and 42 sizes in each series. Smallest is No. 307-183, with 7½ hp and 36-in. table travel, and largest is No. 550-2614, with 50 hp and 168-in. table travel. Table drive is hydraulic motor, worm and dual worm wheel, and twin vertical pinions engaging the table rack, all enclosed in the bed.

Table feed is dog-controlled, and feed rates range from ¼ to 100 or 150 ipm, depending on machine size. Ways are hardened and ground, and are square-gibbed. Lubrication is automatic by pump from reservoir within the bed, which supplies ways and drive mechanism. Float switch stops drive motor if oil is exhausted below low limit. Spindle bearings, gears, and other parts are pressure-lubricated automatically, and arbor-bearing collars gravity-lubricated from reservoir in arbor support.

Spindle speeds are in nine available ranges, from 50 to 2000 rpm for the 300 series, 30 to 1200 rpm for the 400 series, and 20 to 800 rpm for the 500 series. Sixteen speeds are picked off through change gears and a back-gear combination. Two hydraulic multiple-disk clutches power spindle, and are controlled from lever at operator's station on front apron of machine. Four-position directional control lever engages table feed and rapid traverse.

Flywheel effect for fast carbide milling is provided by heavy spindle with bull gear straddle-mounted between two rear anti-friction bearings. Spindle carrier is adjusted vertically on wide hand-scraped square-gibbed ways on headstock. Hydraulic counterbalance helps operator raise and lower carrier.

Dynapoise overarm that dampens self-excited chatter is provided on plain machines. Other features include: safety-interlocked change-gear compartment where opening door disconnects main drive motor; three-way coolant control.

Cincinnati Milling Machine Co, Cincinnati 9, O

. . . including

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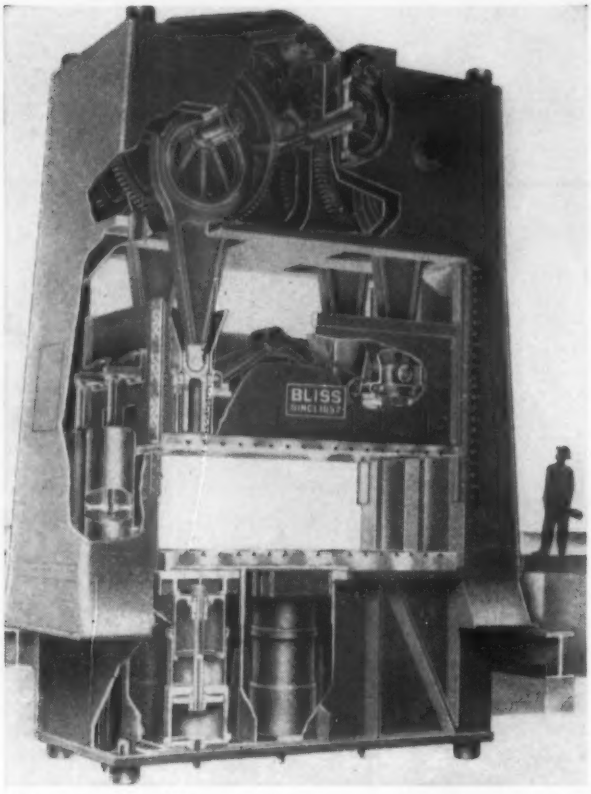
Sealing Belt ..... page 164

Six Bliss "Packaged Press Lines" Feature JIC and Automation

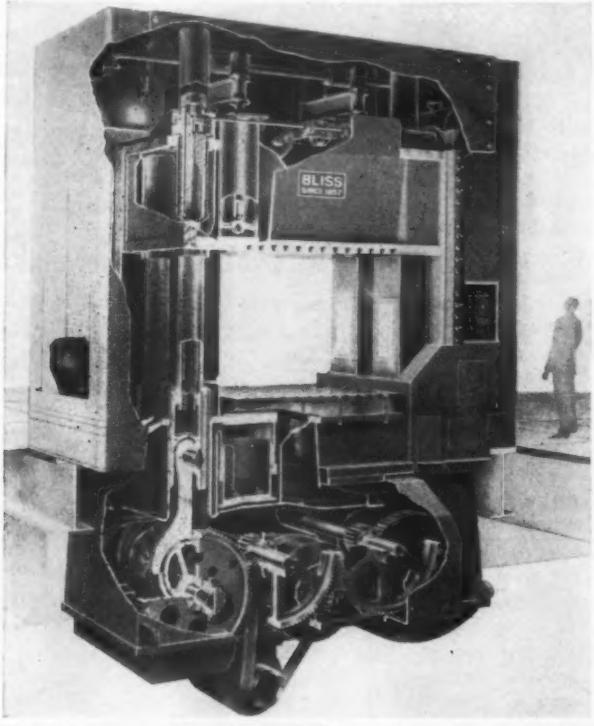


S-4—Four-point, 2000-ton, single-action presses are easy to maintain. Deep front-to-back dimensions, four main gears (with eccentric gears on one side of each main gear), and packaged design

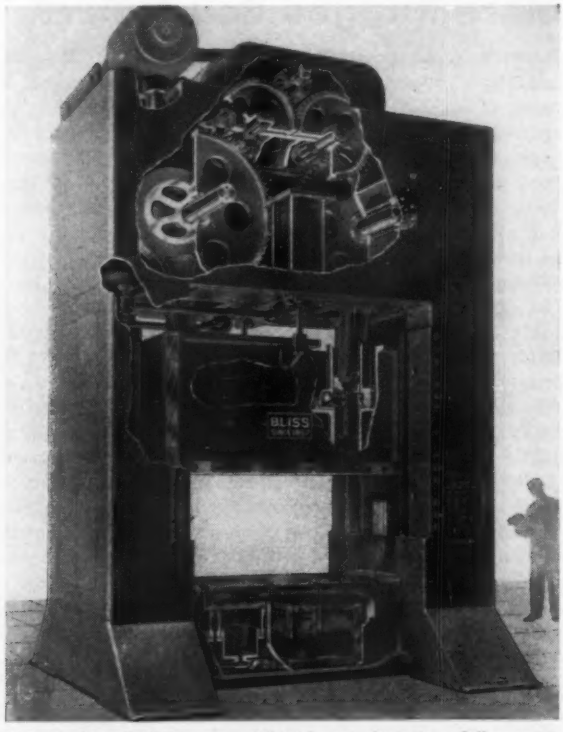
New press designs for automotive and appliance industries, with their engineering cooperation, are centered on single and multi-action types for forming and drawing large stampings. Presses conform to Joint Industry Conference bolster, bed, die and slide area specifications and to blankholder and plunger dimensions. In this way, an auto factory can make several sets of dies and ship them to distant plants knowing that dies will fit. Standard mounting dimensions make it possible to move dies easily from one press line to another in case of breakdowns. All controls, wiring, piping, even power and air line take-offs are built into the uprights. A clean, uncluttered exterior makes it easier to equip them with automatic feeding and unloading machinery. And cranes can come up to them without snagging overhead pipes or wires or bumping into builtup crowns. Installation is simplified because wiring, electric controls and pipes are already positioned; only in-plant connection need be made. Two of the new lines feature the underdrive design, with its lower over-all height to suit low modern buildings or lack of headroom for cranes. Mounting the press drive beneath the floor not only reduces crown height and allows freer crane movements, it also puts maintenance and repair on the lower level.

Of the six new lines, three are single-action (SE-2, S-4, and SU-4), two are double-action (D-2 and D-4) and one, the TU-4, is a triple-action underdrive press. All feature heavier frames, automatic recirculating oil systems, manual and motorized plunger and blank-

NEXT PAGE, PLEASE



SU-4—A 4-point, single-action, underdrive unit has drive mechanism beneath the press and counterbalances in the slide instead of the crown to reduce the height. The main slide rides in extra long gibs, and unusually long connections hold side thrust to a minimum



SE-2—Packaged 250-ton, straight-side, single-action, full-eccentric press is double geared. Speed is about 25 strokes per minute. Four-piece tie-rod construction is extremely rigid for large stamping. Sizes 200 to 2000 tons

A LOOK TO SIDNEY IS A LOOK IN THE RIGHT DIRECTION

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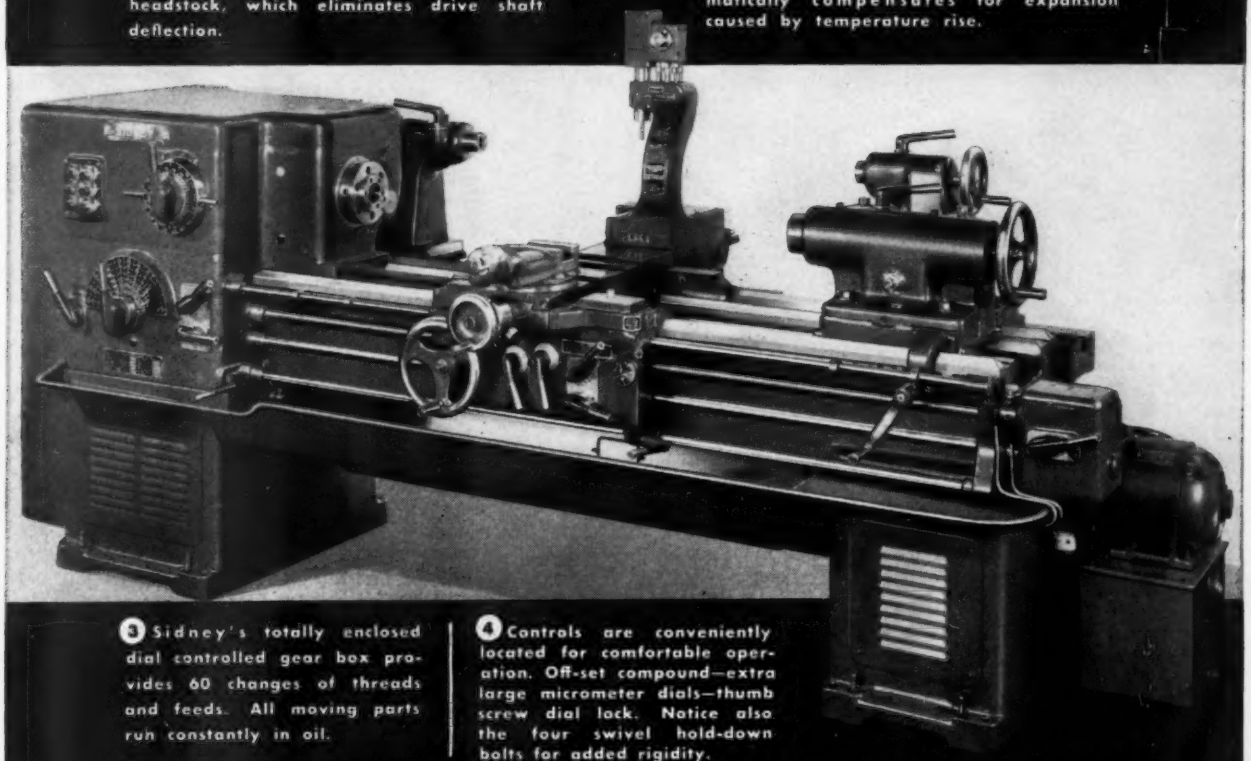
WHY? — *Because here are the points of superiority of*

SIDNEY HEAVY-DUTY LATHES

1 Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on preloaded anti-friction bearings and is full floating on sleeve bolted to back of headstock, which eliminates drive shaft deflection.

2 All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.



3 Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

4 Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.

5 Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

WRITE FOR BULLETINS

SIDNEY FLUID TRACER LATHES furnish greater versatility, wider range of work, unlimited reproduction true to form in every detail.

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

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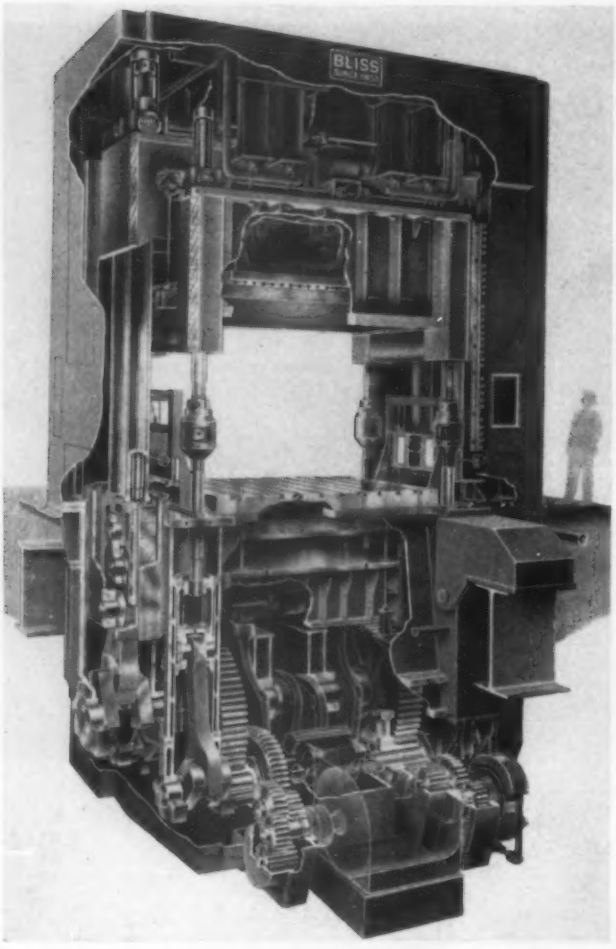
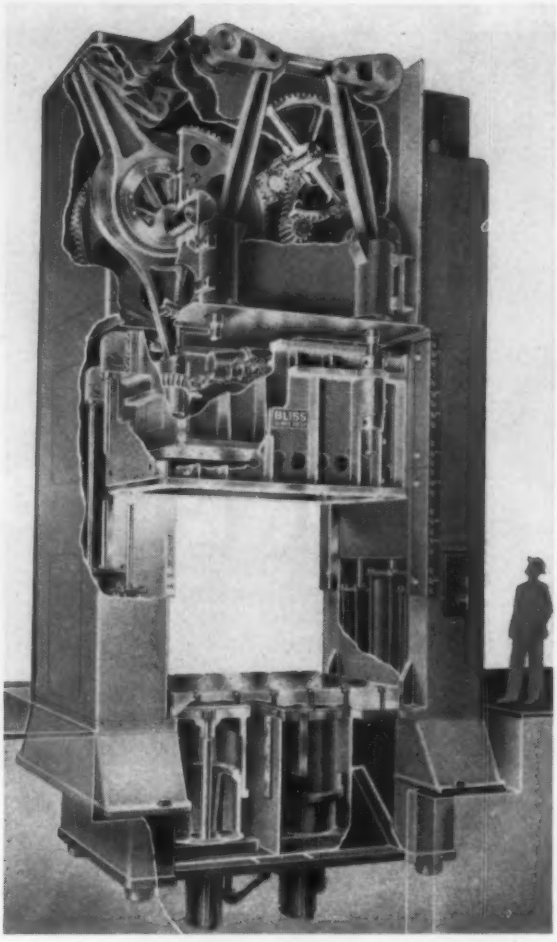
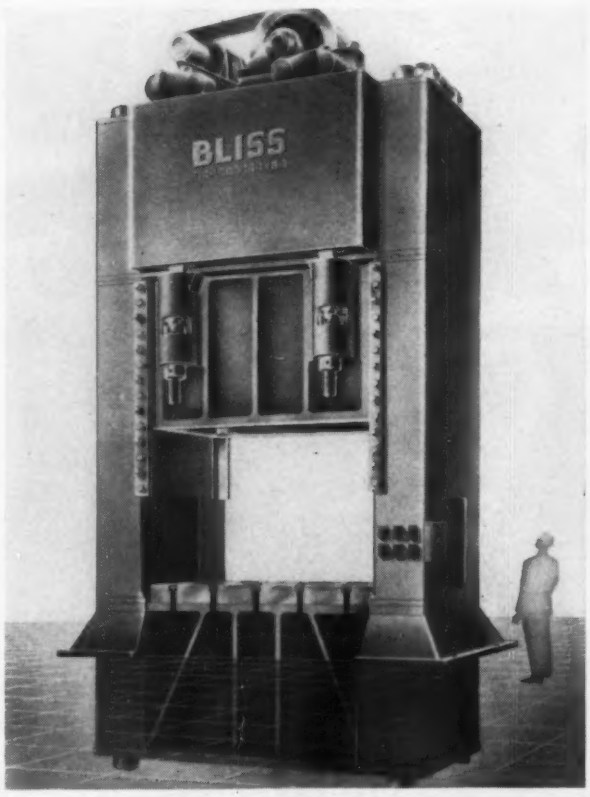




TU-4—This 4-point, triple-action, underdrive press has direct drive through an electric motor with interlocked air brake. Crankshafts drive both plunger and blankholder through a single toggle mechanism which eliminates excess linkage and provides the plunger with greater dwell. Motorized adjustment on the blankholder is the first on a multi-action press by Bliss. Other features: pre-stressed pull-down rods, automatic recirculating oil system, built-in wires, pipes and controls. Speeds up to 10 strokes per min.

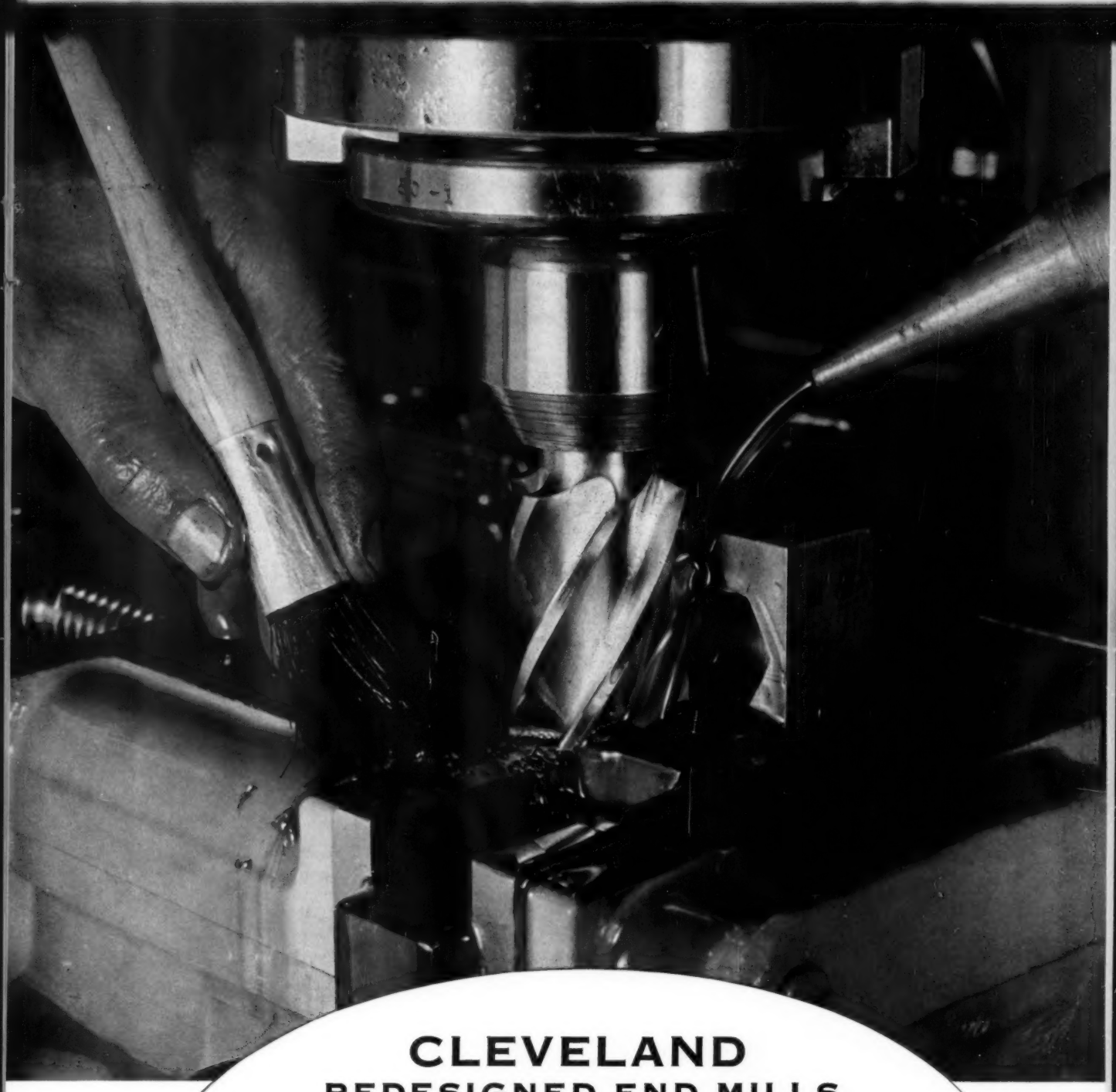
D-2 (top right)—Double-action, straight-side, eccentric, two-point press has air counterbalance cylinders built in. Four-piece shrunk tie-rod construction is keyed for accurate alignment. This press is double-geared, with four main gears symmetrically located and operating full eccentrics. Press is driven through a pneumatic friction clutch at speeds up to 10 strokes per minute

D-4—Four-point, double-action press has former excrescences enclosed. Barrel-type plunger adjustment permits use of dies varying in height, and manual blankholder adjustment compensates for uneven blankholding distribution required by some work. Extremely long slide ways. Press is double geared, with four main gears operating full eccentric and symmetrically located. High-speed air or electric clutches. Speeds up to 10 strokes per minute



holder adjustments, high-speed air or electric clutches and front-to-back shafts. Rugged structures and ease of maintenance are stressed. The new D-2, for example, showed how experience could improve the press design. Crowns were lowered on the new presses to include the bottom of main gears to add to crown strength and to simplify automatic lubrication. Blankholder screw slides were mounted in the crown instead of the slide, which increased press rigidity. And the blankholder itself may be used for drawing when certain types of dies are employed.

The E W Bliss Company, Canton, Ohio.



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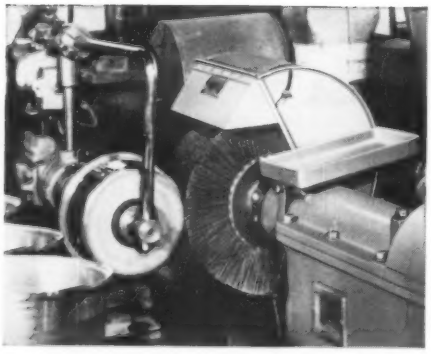


SAVES 33⅓%. *Here, Osborn Power Brushing polishes stainless steel utensils in two steps where it formerly took three. Finishing time is cut 33⅓%. This is typical of results obtained with an* **OBA.**

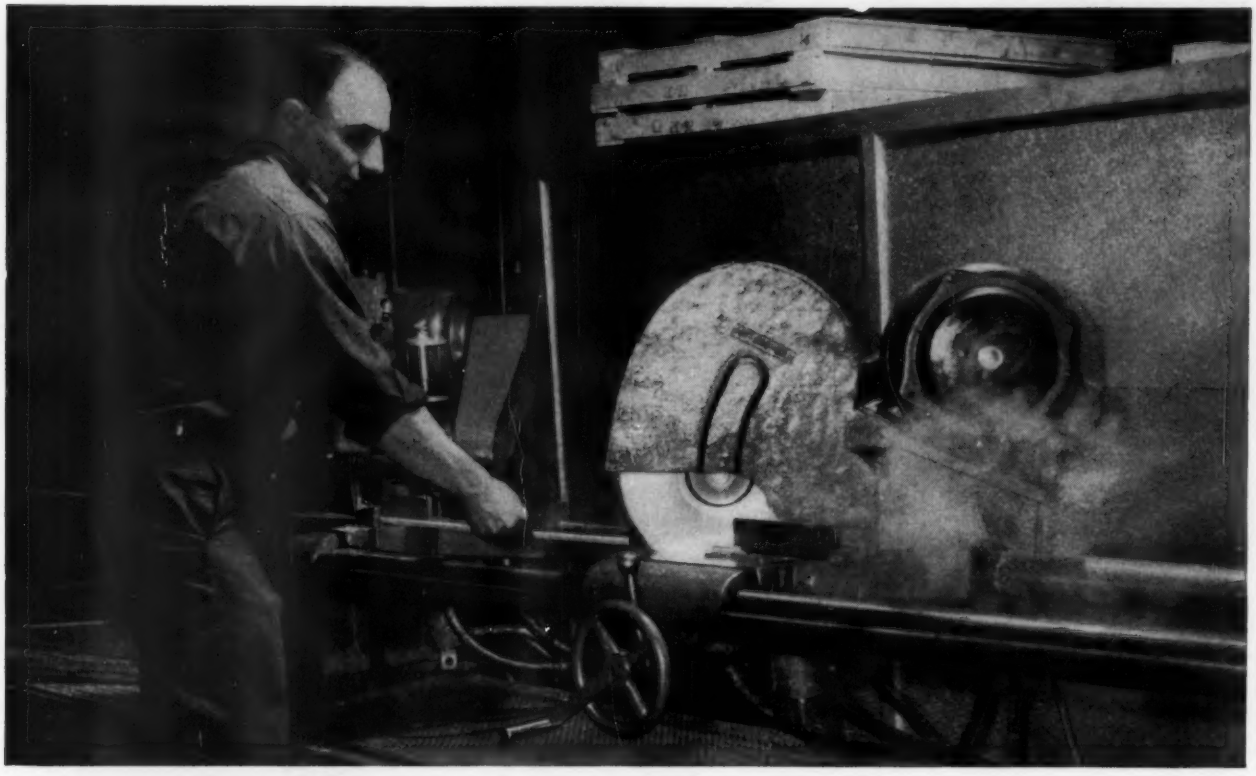
POWER brushing may be the answer to a higher-quality product for you. To find out, have an Osborn Brushing Specialist take a close look at your cleaning, finishing and burr removal operations. When making an **O**sborn **B**rushing **A**nalysis, he studies these operations and submits a written report with recommendations for improvements.

In your plant, power brushing might improve product quality—and save thousands of dollars every year, too. Ask for an **OBA**. There is no obligation. Just call or write *The Osborn Manufacturing Company, Dept. C-28, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES



Aluminum Air Seal Mfg. Co. Reports:

"OUR PROBLEM WITH GRAVITY OILERS WAS SOLVED BY CITIES SERVICE CUTTING OIL!"

When flow of oil from gravity oilers was restricted by gum formation and residue, Aluminum Air Seal Mfg. Co. switched to Cities Service Chillo #22 Cutting Oil. Results: Plenty of oil flow, increased saw life, cleaner finish cuts!

Here's the report as Cities Service received it from D. C. Cover, Plant Supt. of Aluminum Air Seal Mfg. Co.:

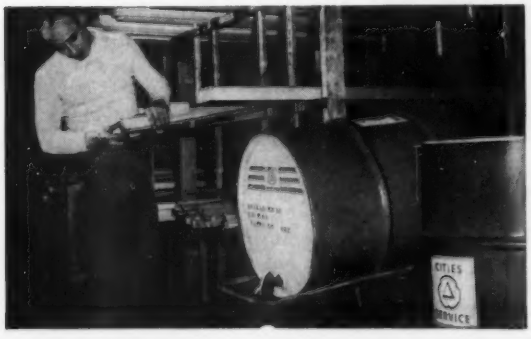
"For the past three years we have been using your Chillo #22 with excellent results.

"Prior to that time, we experienced considerable trouble because our gravity oilers were not functioning properly due to residue and gum formation which restricted the flow of cutting oil to the saw. Consequently, this inadequate supply of cutting oil permitted excessive wear which, of course, greatly reduced our saw life.

"At this time, a Cities Service Lubrication Engineer called on us and recommended Chillo #22 as a solution to this problem. Not only was the problem of adequate supply eliminated but we found the oil gave excellent saw life as well as clean finish cuts.

"As you know, we supply aluminum stock to Trim-a-Seal plants throughout the country. *Whenever a new plant is set up we recommend that they use your product for cutting because we know it will do the job.*"

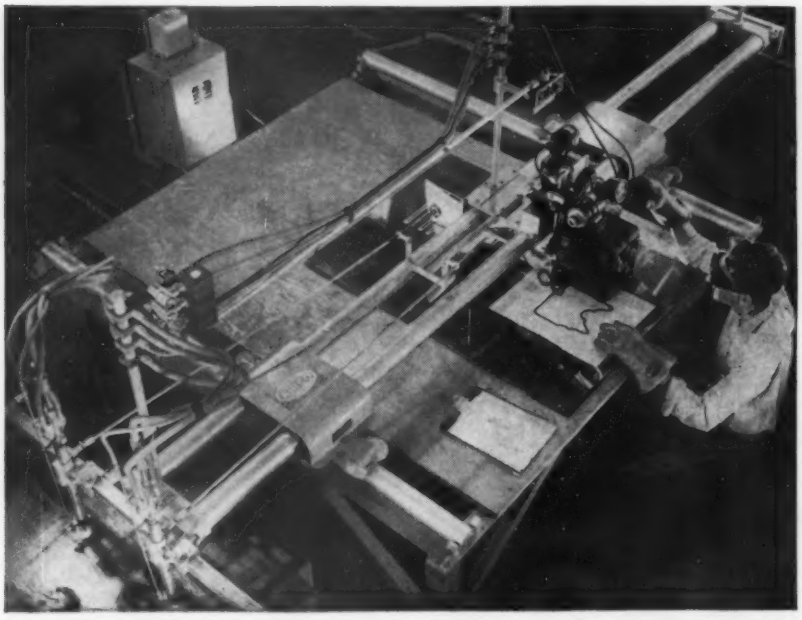
If you'd like to learn more about the oil "we know will do the job," contact your nearest Cities Service representative or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



EXAMINING ALUMINUM EXTRUSION, an Aluminum Air Seal employee observes clean cut made with help of Cities Service Chillo #22 Cutting Oil. Firm supplies aluminum stock to 25 Trim-a-Seal plants throughout country.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

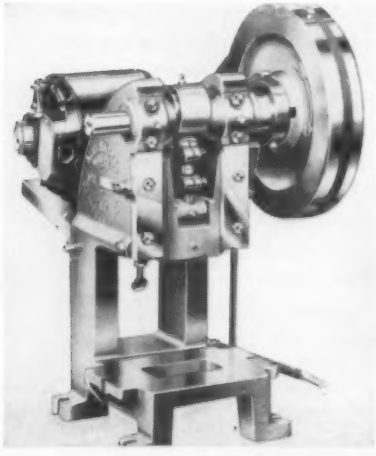


Air Reduction Introduces Gas Cutting Machine

Airco No. 48 Duograph is a rectilinear-type, medium area, oxy-acetylene shape-cutting machine with four-torch capacity. Cutting range with one tracing table is 48x51 in. Four 48-in.-dia circles can be cut simultaneously. Each additional table extends cutting length 80 in.

Three tracers—electronic, magnetic, and manual—are interchangeable on the machine. All controls are grouped at the operator's station. Torches are equipped with pilot light assemblies and remote control extensions for raising and lowering torches.

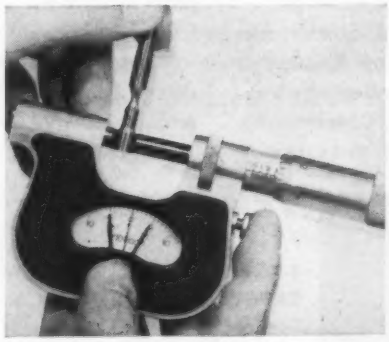
Air Reduction Sales Co, 60 E 42nd St, New York 17, NY



Bench-Type Punch Press

Model B-2, 2-ton power bench-type punch press is reported ideal for production of small stampings. It features single-pin clutch with positive non-repeat or repeat action; straight ram guides with flat gib; and accurate adjustment of ram with positive lock. There is an extra-large die space and in many cases punches and dies can be made from cold rolled stock. Model has a capacity to 200 operations per minute and requires 1/3-hp motor with direct V-belt drive. Stroke is ¾ in. Price: $97.50.

Alva F Allen, Punch Press Dept, 1001 N Third St, Clinton, Mo



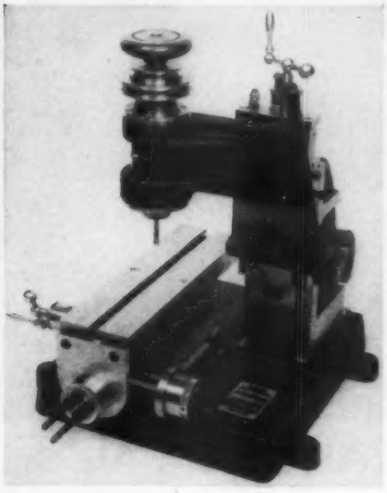
Indicating Micrometer

Indicating micrometer has a range from 0 to 1 in. reading in 0.0001-in. graduations. The indicating mechanism controls measuring pressure.

The Master Compar provides the user with a set of the go and no-go gages of 1-in. range. It detects out-of-roundness and taper. Release button for movable anvil is on right side of the dial.

Said to be new is the resetting to zero accomplished by screw at bottom of housing. Tungsten-carbide anvils and finished hardwood case are standard equipment. Price for 1-in. size is $95.

George Scherr Co, Inc, 200 Lafayette St, New York 12, NY



Micromill Redesigned

Machine for precision milling has been redesigned to include four-position stops. Stops have been added to provide the operator with four positions in each direction and means for accurate hole location on small jig work.

Vertical micromill will handle drilling, reaming, tapping, counterboring, spotfacing, and grinding, in addition to milling. New headstock has preloaded duplex bearings and speeds up to 20,000 rpm. Designers claim spindle run-out of less than 0.0001 in. at mouth. Standard Magnus chuck, capacity ¼ in. can be used.

F W Derbyshire, Inc, Waltham, Mass

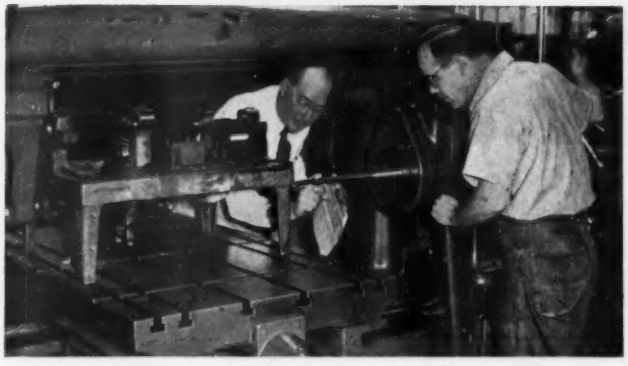
Barrel Finishing Compound For Light Metal Die Castings

Honite brand Micro Cut has been developed for use on die castings of zinc, aluminum, and similar metal alloys.

Compound removes light machine marks and reportedly leaves an extremely fine surface finish, with a minimum of stock removal, avoiding deep scratches and exposure of porosity in castings.

Minnesota Mining & Manufacturing Co, Dept A-1620, 900 Fauquier St, St Paul 6, Minn

HY-PRO SPECIALIZES IN TAP PROBLEMS



TAP PROBLEM? You'll be safer to call on Hy-Pro. They specialize in solving all tap needs.

HY-PRO SPECIALIZED ENGINEERS are always ready to work closely with you in analyzing and recommending money saving improvements in your operation.

. . . to lower *your* unit costs

Hy-Pro's business is solving tap problems . . . problems which cost you time and dollars. Because their whole operation is centered on tap business, Hy-Pro can continually concentrate their research and creative staff in analyzing and improving every phase of tap use.

The result has been Hy-Pro's established reputation in production circles as "*The Tap Specialists*", backed by a complete line of high quality taps.

You can contact them directly or through your nearest distributor. Their engineer specialists can help lower *your* unit costs.

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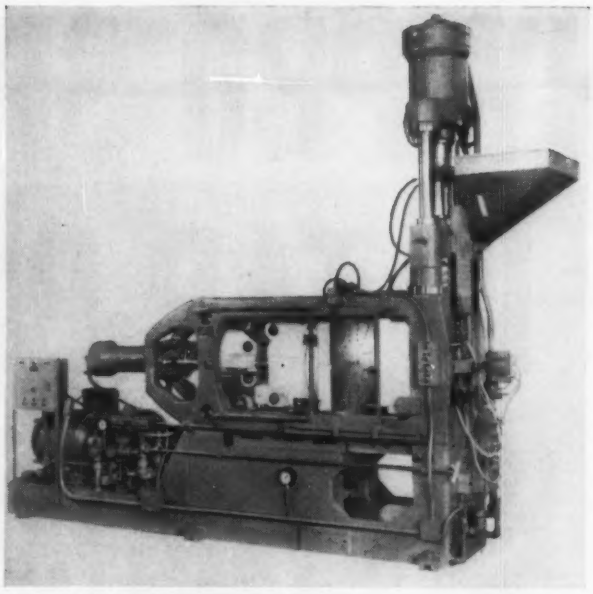


Unit Tests and Sorts Automotive Springs

Automatic testing and classification of springs for passenger automobiles at 700 per hour is performed by Spring Bulldozer. Springs are classified as soft-good, hard-good, soft-no good and hard-no good. Springs come in on a conveyor, are tested and drop onto discharge conveyors automatically and continuously.

Springs are compressed by continuously operating mechanical ram driven by a standard cone-drive speed reducer. There are actually two compression stations. An electric clutch brake prevents ram from moving forward while machine is indexing.

A 10-hp motor is connected to the worm of the reducer by means of four-groove sheaves and V-belts. Motor speed is 900 rpm; input speed is 225 rpm.

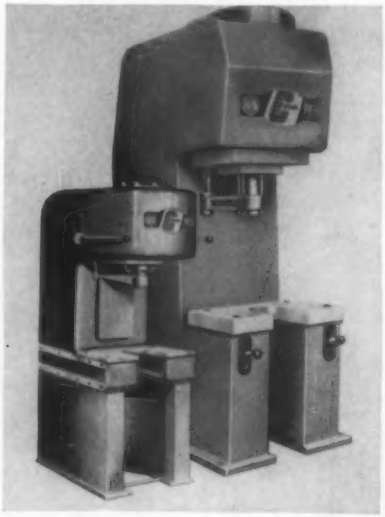
Hautau Engineering Co, Ferndale, Mich

Injection Molding Machine Has High Pressure and Mold Area

Model L-2-12 molds 12 oz of polystyrene, yet has a recommended casting area (at 20,000 psi on end of plunger) of 135 sq in. and mold closing pressure of 400 tons. The injection plunger has a 14-in. stroke at 171 ipm.

The machine has internally heated cylinder with narrow band heaters on the outer wall.

Lester-Phoenix, Inc, 2711 Church Ave, Dept N-41, Cleveland 13, Ohio



Hydraulic C-Frame Presses For Low Pressure Use

Standard line of oil hydraulic C-frame presses ranging from 2 to 200 tons includes 11 sizes. For each model there is a choice of control valve assemblies. Operating controls include single or dual safety operating levers, electric pushbutton, foot switch, foot pedal and other standard types.

Features include high-speed differential circuit, inching control, and specially designed open C-gap frame which eliminates encumbrances within tooling area. The 60-sec ram-stroke adjustment is located away from the tooling area.

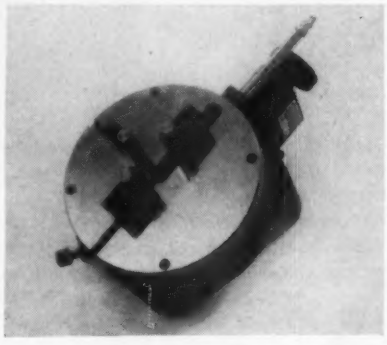
The self-enclosed frame design features compact power units which can be easily removed. The relief valves provide an infinite range of tonnage regulations.

Hydraulic Press Mfg Co, Mount Gilead, Ohio

Alloy Welding Rod

Hardfacing rod, Mir-O-Col No. 1, for either electric or oxy-acetylene single pass applications where thin overlay of extreme hardness is needed. Improved balance of alloys is said to provide better flowing characteristics for smooth, fast deposit of weld beads.

Mir-O-Col Alloy Co, 212 North Ave 21, Los Angeles 31, Calif



ID, OD Diameter Gage

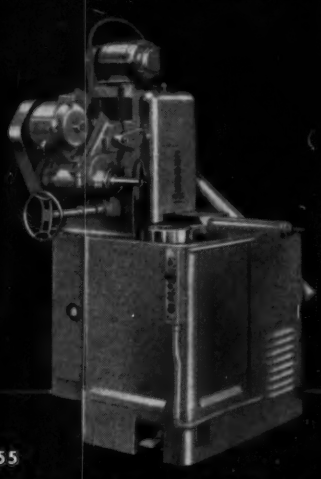
Model K4R bench comparator checks both diameters. Built-in Acrament system of super fine adjustment with 0.010 range provides control and accuracy for use with mechanical indicator or air-probe type of gaging. Same bracket will accommodate any AGD standard indicator or air-probe.

Standard jaws provided are adjustable for up to ¼-in. height of measurement setting. Range is: max OD 5 in., ID, 5 in.; min OD ⅛, ID 7/16 in.

Acra-ment Gage Div, Myer Corp, Park Ave, Cranston, RI

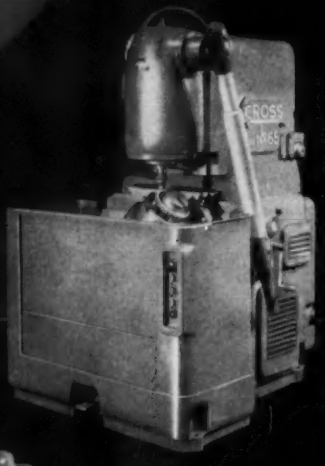
Greater Flexibility with Cross Gear Machines

for rounding • chamfering • pointing • burring



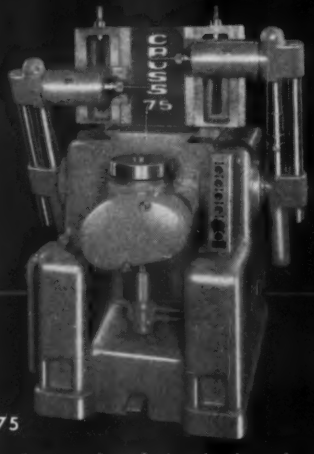
NO. 55

For rounding, pointing, chamfering or burring external and internal—
spur gears • helical gears
clutches • splines
Typical production—rounding or pointing 8 pitch 30 tooth gears—55 net hourly.



NO. 65

For pointing or chamfering external and internal—
clutches • spur gears
bevel gears • splines
Typical production—pointing 10 pitch 30 tooth gears—100 net hourly.



NO. 75

For burring or chamfering both ends at the same time—
helical gears • spiral bevel pinions
hypoid pinions
Typical production—chamfering 8 pitch 40 tooth gears—200 net hourly.

- ★ **Flexibility for handling a wide variety of gears.**
- ★ **Rugged, heavy duty construction for continuous high production or job shop operation.**
- ★ **Short setup time (as little as 15 minutes) for changing from one gear to another.**
- ★ **Simple, inexpensive tooling.**
- ★ **Push button controlled automatic cycle.**
- ★ **Hydraulic power work clamping.**

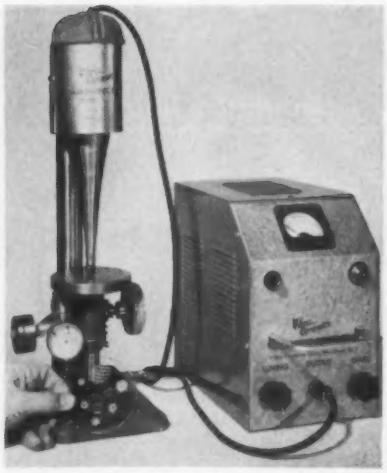
For mass production or short run jobbing operations, there is a Cross Gear Machine to suit your requirements.

Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS



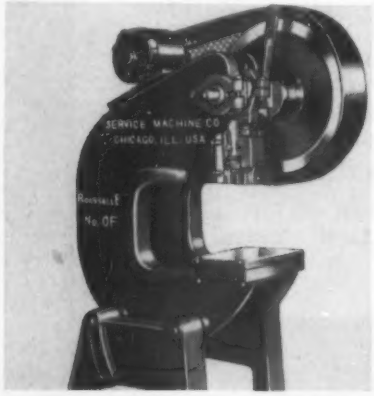
Ultrasonic Drill Uses Ceramic Transducer

Model U 600 ultrasonic drill employs a Glennite ceramic transducer to avoid heating or deformation of work surface. The transducer consists of a piezoelectric tube bonded to a mechanical transformer in form of an exponentially tapered horn.

Design achieves a high degree of mechanical driving energy—max power required to drive drill is 35 w and generator supplied is contained in cabinet 9x9x6 in. Drill is reported useful for glass, tungsten carbide, sapphire, ceramics, and hardened steel, drilling within tolerance of 0.0005 in.

Interchangeable working tools are screwed directly into end of aluminum horn. Tools are brazed onto end of hex-head cap screw. Three horns are available to accommodate 8-32, ¼-28, and ½-20 screws to cover tools through ranges of 0.01 in. to 0.75 in. in diameter.

Vibro-Ceramics Corp, Metuchen, NJ

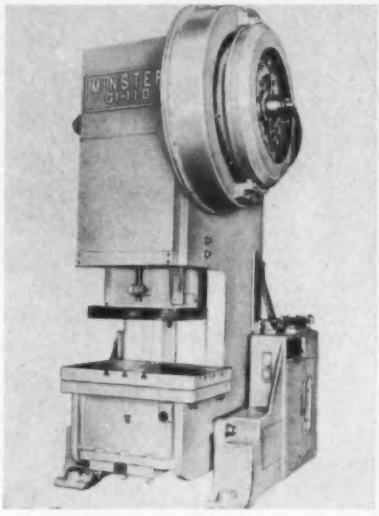


Inclinable Punch Press Features Deep Throat

Rousselle Model OF-5-ton open-back inclinable punch press features a 9-in. throat which permits working to center of 18-in. sheets. Frame is heavy semi-steel casting with 6-in. opening through back. Double-wall design provides strength and rigidity.

The press also features large opening in the bed for ample slug clearance. Flywheel operates at 250 rpm. Die space is 7½ in., standard stroke, 1¼ in., weight, 575 lb. Unit can be furnished in either floor or bench model.

Service Machine Co, 7627 South Ashland Ave, Chicago 20, Ill



Minster Gap Presses Have New Frame Design

A line of fabricated-steel gap presses has been introduced by Minster. Illustrated is one of the G1-110-ton geared presses adapted to automation with built-in panel-leg control cabinets containing all electrical, air, and lubrication controls. The patented adjustable-in-motion rotary limit switch is direct-driven through mitered gears.

The presses may be fixed or inclinable base—the inclining-base type is arranged for inclining to three fixed positions from vertical to 30° and can be equipped with manual, air-powered, or motorized inclining attachments.

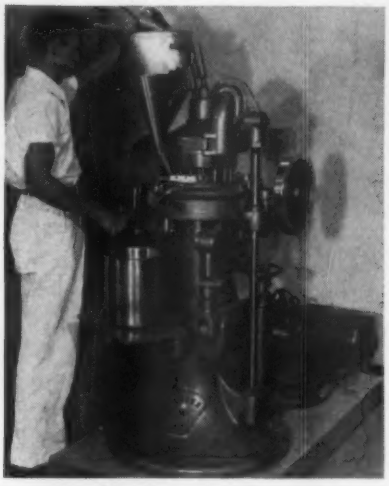
Featured is the massiveness of the steel C frame construction. Crankshafts are machine, ground and roll burnished. Main bearing housings are supported from all angles with heavy steel plate, located and welded. Bearings are nickel-bronze bushed, honed, and preloaded. All gears and pinions are totally enclosed and running in oil.

Slides have box-type cast construction; ways are long, bronze-lined and scraped square to slide face. Rear ways are 90°, front 45°; flanged sides are standard.

Die cushions are telescoping and internally guided for travel in perfect alignment. An extra feature is the die light mounted at back of press throat.

Brief specifications are: 110 tons with slide stroke of 5 in. with 80 or 105 fpm on flywheel press, or 37 fpm on geared press.

Minster Machine Co, Minster, Ohio



Rotary Tabletting Press Compacts Multi-Layers

Stokes rotary tabletting press can compact tablets of more than one layer. Up to three layers each of different materials can be obtained.

The press is a modification of the standard Stokes press with the addition of one or more extra hoppers and feed frames and corresponding number of weight adjusting and filling cans. Only one compaction per tablet is used. Multi-layer feature is available on presses ranging from Model B-2 16-station press with maximum pressure of 4 tons to Model DDS2 11-station press with maximum pressure of 15 tons.

F J Stokes Machine Co, Inc, 5500 Tabor Rd, Philadelphia 20, Pa

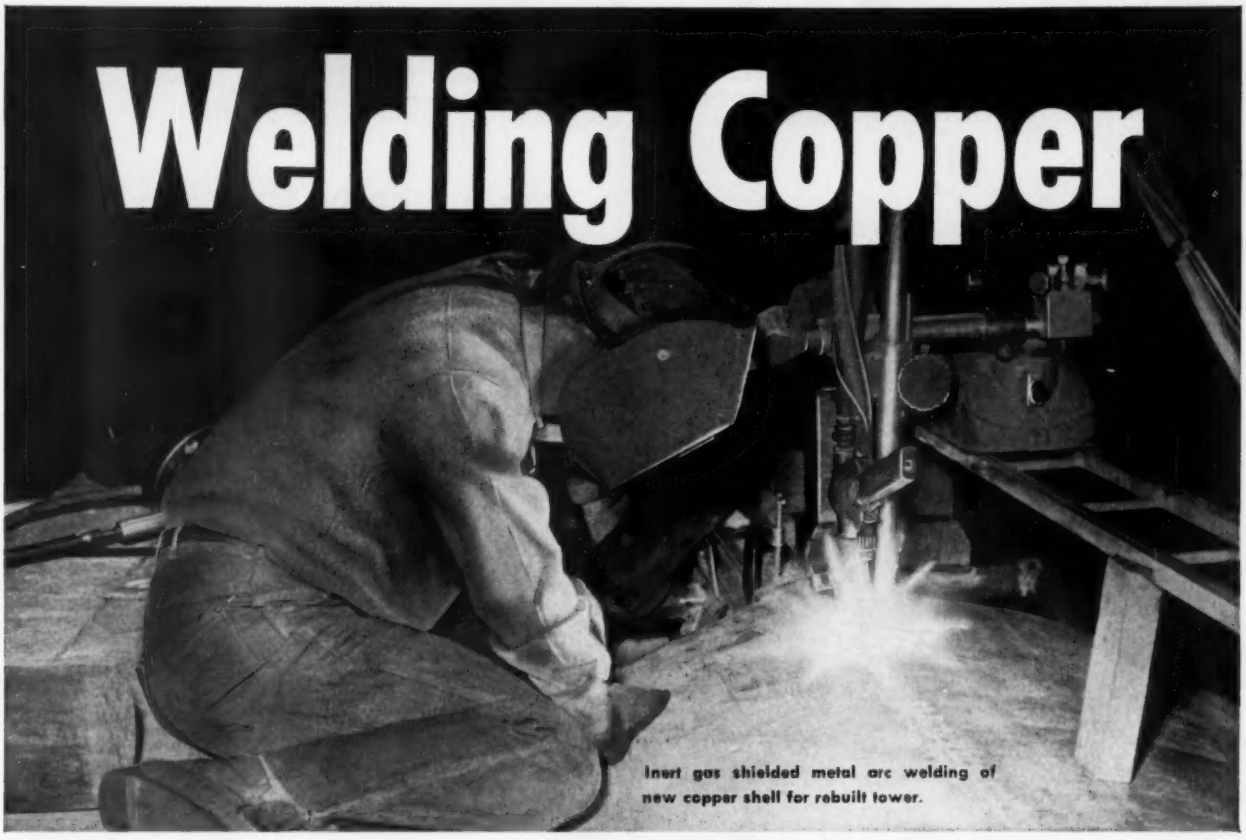
Portable Induction Heating Unit

Self-contained high-frequency Model RRP combines an induction heating generator with a refrigerating water recirculator. Permits use of long flexible leads between unit and work coil for cases where work to be done is at a distance from the generator.

Unit can also be used for soldering, brazing, and heat-treating ferrous and non-ferrous metals. Operates on 110 or 220 v, single-phase; contains a stepless Thyratron power output control.

Lepel High Frequency Laboratories, 55th & 37th Ave, Woodside 77, LI, NY

Welding Copper



Inert gas shielded metal arc welding of new copper shell for rebuilt tower.

SAVES 38% in materials and labor for joining

Some time ago, the Tennessee Eastman Company, Kingsport, Tennessee, a Revere customer, began to rebuild some of its copper stills or fractioning towers, which previously would have been silver-brazed. Revere's welding specialists were called in to see whether or not welding would be superior. Demonstrations were made to Tennessee Eastman engineers and shop personnel, with the result that welding was adopted. Actual experience in the shop shows a saving of 38% in materials and labor for joining, and a better job in every way. The welding method used is the inert gas shielded metal arc process.

Reconstruction of the towers was made to reduce the number of flanges. At the same time Tennessee Eastman changed from the flange joint tray construction to the inserted tray type and incidentally, reduced the number of gaskets with their accompanying maintenance problems. The trays are salvaged by shearing off the bolt hole circle and folding up the edges. The towers are some 45′ high, 6′ to 10′ in diameter, with a tray or bubble cap plate at specified intervals. Tennessee Eastman plans to rebuilt several towers a year in this economical way.

It will pay you as it did Tennessee Eastman to look into welding as a modern method of joining copper. Remember Revere is fully experienced in the most modern and efficient methods, and will collaborate with you on their application.

REVERE

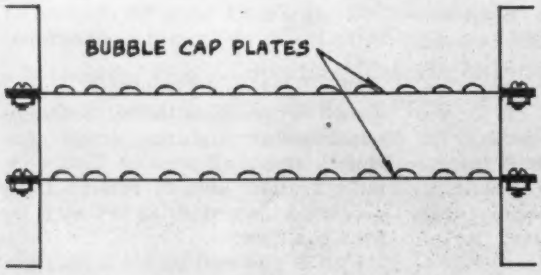
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

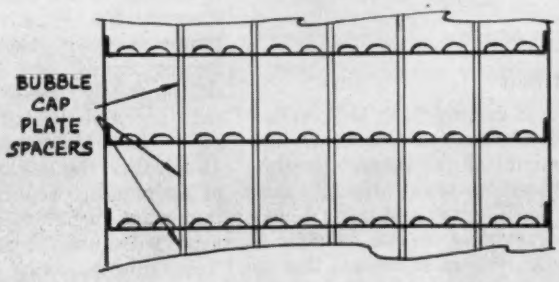
230 Park Avenue, New York 17, N. Y.

• • •

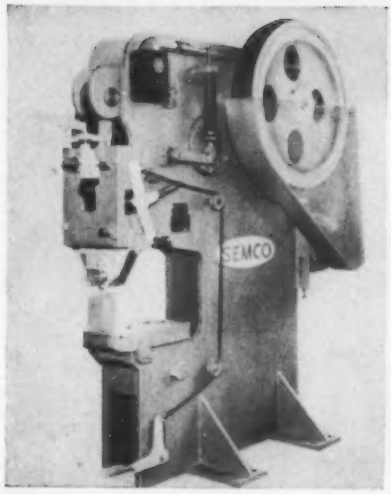
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.



Section through old tower, showing bubble cap plates held in bolted flange.



Section through new welded tower. Bubble cap plates have had bolt holes sheared off, edges turned up. They are held in place by spacer rods.

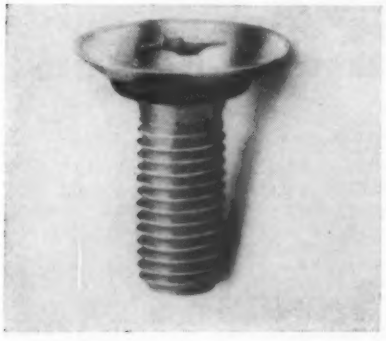


Structural Punch Rated at 60 Tons

The Semco S-34 is 81 in. high, 72 in. deep and rated at 60 tons. Holes up to ⅞ in. in dia in ¾-in. mild steel and to 1 1/16-in. dia in ⅝-in. mild steel can be punched. Throat is 20 in. deep and 14 in. high and machine is equipped with two sets of punching tools; a high die block for punching webs and flanges of 10 in.; a low die block for punching flanges down to 4 in. The floating punch head of the machine permits setting punch to idle up and down, barely touching work on each stroke.

The machine, including a 5-hp, 1800-rpm motor was especially designed to fit the needs of structural steel fabricators.

Service Machine Co, Inc, 226 Miller St, Elizabeth, NJ

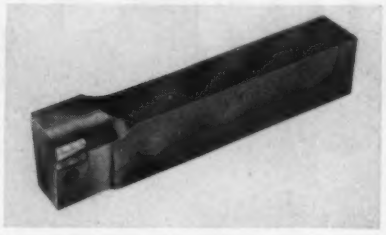


Sealing Bolt

Single-unit sealing flush bolt, called Bolt-O-Seal, incorporates controlled confinement of a rubber sealing gland, based on same principle employed in the manufacturer's Lock-O-Seal fastening device. There is reportedly no loss of sealing due to cold flow, and memory factor of the rubber is always retained because of special design configuration which eliminates deformation beyond the elastic limits of the rubber gland.

Standard sizes and styles seal gases or liquids up to a maximum of 50 psi.

Franklin C Wolfe Co, Dept BOS-1, 3644 Eastham Drive, Culver City, Calif

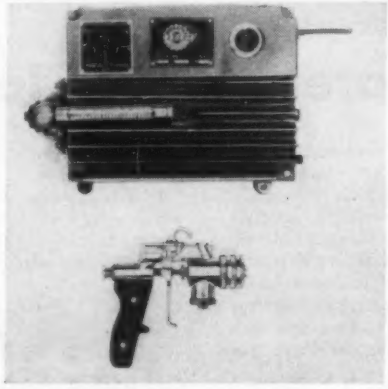


Cutting Tool Has Three Adjustable, Mechanical Elements

Single-point cutting tool employs wafer-design, indexable, throwaway carbide insert; adjustable, mechanical chip control; and hardened, replaceable anvil.

Triangular and square inserts are available, style A, B, G; standard shank sizes No. 12, 16, 54, 64, 85, 86. Additional information in Bulletin 54.

Viking Tool Co, Shelton, Conn



Cold Paint-Spray System Converted to Hot Volume

Model V-950 ThermoVolumaire unit enables conversion of high-pressure cold paint-spray system to hot-volume air spraying at controlled temperatures of air and heat between 80 and 250 F. Air at negligible temperature is used and rapidly decompressing air cools paint instantaneously below ambient temperature and deposits it on surface cold. The Volumaire method of atomization by air volume instead of air pressure reportedly results in important economies. Spray gun used with unit is standard Roxon Volumaire universal gun which produces round or flat jet ½ to 12 in. wide.

Roxon, Inc, 50 Broad St, New York 4, NY

Massive Aluminum Forgings Trimmed by Clearing Press

This 2000-ton press uses hydraulic power to obtain continuous pressure over long stroke and permit quick adjustment of stroke length. It is of housing-type with pre-loaded tie-rod frame construction.

When slide presses through work it also presses against cushion cylinder designed to withstand full press tonnage.

The hydraulic system is decompressed gradually with cushion restraining movement of slide.

Clearing Machine Corp, Div U S Industries, Inc, 6499 West 65th St, Chicago 38, Ill

Magnetic Nail Conveyor

Rapistan magnetic conveyor for handling ferrous materials up a steep incline will handle nails or small processed parts, and elevate them from production machinery to another conveyor—hopper, tote-box, shipping, or storage container, on its ribbed top rubber belt, as it travels over a magnetic field.

It can also be used for removal of scrap materials from the operational area.

The lightweight conveyor is designed to operate with low discharge nail-heading machines, screw machines, or punch presses. Two 4-in. pulleys allow unit to receive from production machines as low as 6 in. from the floor.

Unit is powered by a 1/3-hp right angle gearhead motor at a belt speed of 85 fpm.

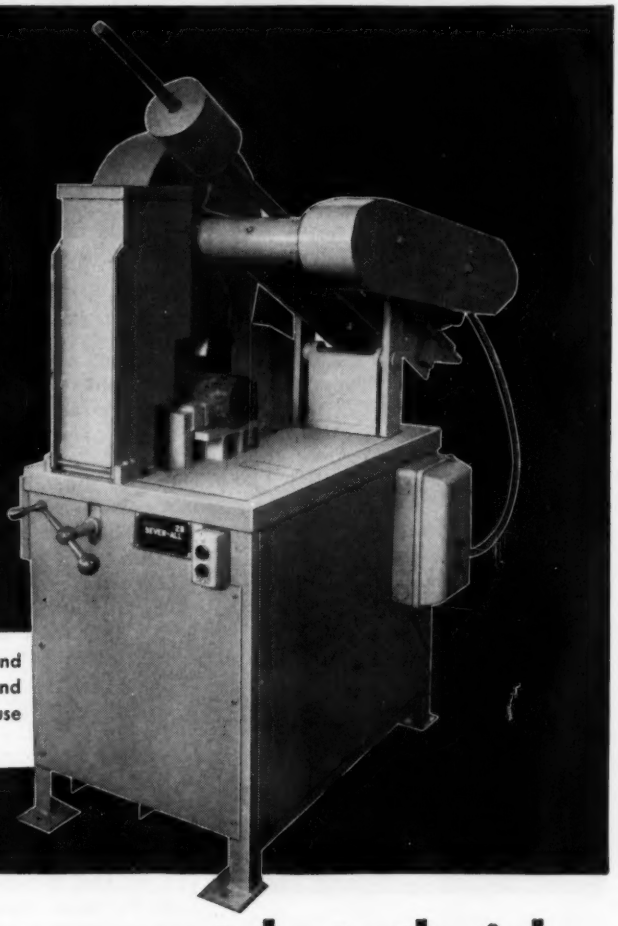
Rapids-Standard Co, Dept MN, 342 Rapistan Bldg, Grand Rapids 2, Mich

Campbell Abrasive Cutter

an ACCO product

New Model 28 Campbell Sever-All Dry Cutter

- Compact
- Portable
- Ideal for contract or construction work



CAPACITY: Solids up to 4" x 4" square, angles and channels to 8", tubes and pipes to 4" O.D., 4" angles and channels and 4" O.D. pipe at 45° angles. Based on use of 18" cutting wheel and 10 H.P. motor.

Here's a versatile cutter you can take to the job

• This new CAMPBELL Model 28 SEVER-ALL Abrasive Cutter is a dry-cutting machine which combines the capacity for a wide variety of cutting operations with a compactness which permits a portability seldom found in cutters of its type and capacity. It is ideal for cutting all types of material in contract or construction work. Can be supplied with work stop and with wheels for easy movement from job to job.

From front to back, the SEVER-ALL measures but 56". It is only 32" wide and 62" in height. Other important features include:

1. Work clamped on both sides of cut by hand-operated, self-centering work holders. Can be supplied with foot-operated treadle.

2. Time of cut is approximately 3 seconds per square inch of material.

3. Operator safety provided by complete enclosure of cutting wheel during operation—except for openings to clear the work.

4. Lowering of guard permits accurate location of work, permits long pieces to be placed in machine without threading through.

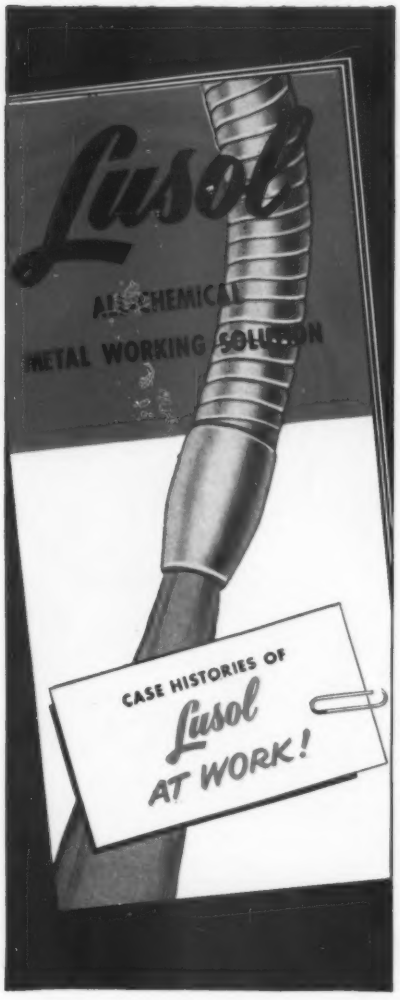
This Model 28 SEVER-ALL cutter is the newest of a long line of CAMPBELL Abrasive Cutters which provide many exclusive features. CAMPBELL field engineers are conveniently located to consult with you on ALL your cutting problems. Write today for specifications on the SEVER-ALL or **Bulletin DH-301** on the CAMPBELL Abrasive Cutting Method.

ACCO

Campbell Machine Division
AMERICAN CHAIN & CABLE

923 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers



This leaflet tells how Lusol works to the advantage of the machine operator *and* management

FOR A FREE COPY— MAIL THE COUPON *on the opposite page*

ROUND TABLE *Discussion*

MUFF 'N STUFF

Is it better to attempt to track down the operator responsible for a piece of spoiled work, or should a reasonable amount of scrap be overlooked? Will the worker profit by an individual lecture?

IF AL IS VENGEFULLY TRACKING DOWN the men of his crew who spoil work he's not a good leader. But on the other hand he should ask himself, why do some of my guys produce scrap?

There are many reasons why some details don't pass inspection. I once was busy turning some crankshafts for small semi-diesel engines on a lathe when I discovered that one of the snap gages I used was faulty. Then I had already spoiled two shafts. I went to the foreman and told him about it. As I expected, he bawled me out, hinting that I had purposely damaged the gage. Then he went to the toolcrib man and bawled him out too. I felt bad a long time after this incident, and I'm afraid I'll never forgive this foreman for his unfairness. Machines or tools may be out of true, or damaged, and this should not be charged to the man doing a poor job. It is the toolcrib man's duty to check measuring tools and the foreman himself should look after the machines, at least in small shops.

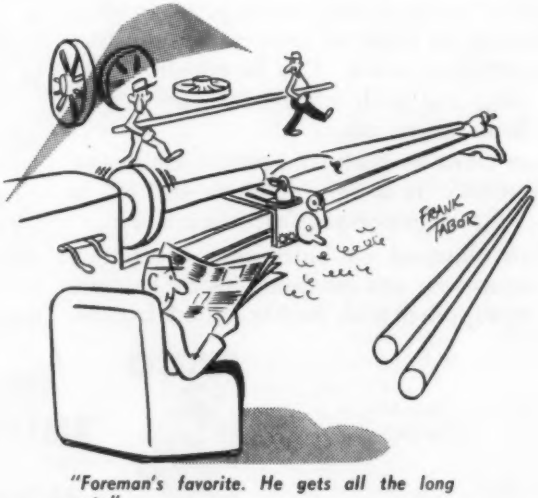
Also the material worked may cause trouble. For instance, a casting may be so uneven in its structure that the cutting tool doesn't behave at all the way it should, and might be the reason why faulty pieces are made.

I have some personal experience on that, too. Once my foreman told me to drill the boltholes in some circular cylinder heads for large semi-diesel engines. In the batch I found some of the castings very hard. Although I lowered the speed of the drill, and fed it carefully by hand, I spoiled both the drill and the work anyway. The drill tried to get off the center and creaked terribly under the pressure I had to apply to get anywhere. Then I went to my foreman and told him about it. He said he didn't have any other castings and told me to try again, especially since this was a rush order. I went back to the drillpress and continued my work, but suddenly the 1-in.-dia high-speed steel drill I used burst into several pieces, and the fin between the hole and the outer edge of the head broke out.

No man is able to work for years in machine shops without making some scrap. The manager at a place where I was employed told me one day that if a man never makes any mistakes he probably doesn't do much useful work either. And this, I think, is very true. Any foreman ought to be very careful when passing judgment on any of his men.

For the past 15 years or so machine shops all over the world have been invaded by men who have known little if anything of the kind of work they were expected to do. They have sometimes also received inadequate, if any, instructions on how to go about their duties, and the result is more scrap.

The hunting Ed and Al talk about should set in before any faulty work reaches the inspector. If necessary, the inspector should check the first piece of every batch to ascertain that everything is in order. Should he



"Foreman's favorite. He gets all the long cuts."

BECAUSE *Lusol* IS DIFFERENT... WE DARE SUGGEST A SHOP-WIDE TEST!

Prove Lusol—not in just a single machine—but in a lathe, boring mill, grinder, milling machine and drill

THE DIFFERENCE—Unlike ordinary coolants, Lusol is an oil-free, all-chemical concentrate to which you add water to suit the machining operation. Water, the best coolant known, is made wetter so that it gets to the tool point and carries off heat faster. With Lusol there is no rusting, no skin irritation, no smoking to foul shop atmospheres.

YOUR BENEFITS—Superior heat dissipation means that your present equipment can be worked harder, yet your men find things easier—higher speeds and feeds, with less downtime for sharpening tools, finer finishes and closer tolerances. Improved working conditions result in better morale among your employees.

These benefits become shop-wide as your workmen recognize Lusol's advantages and ask for it in their machines.

AN OFFER—Prove to your own satisfaction—in your own plant, in your own machines—that Lusol will do all we say it does. Our field engineers will help you clean out the machines marked for the test and install Lusol in proper concentrations. Past experience in hundreds of metal working machines indicates you'll do jobs faster and better.

TO GET THIS TEST WORKING, MAIL THIS COUPON

We'll have a Lusol field engineer call and arrange to run the test in your own plant.

F. E. ANDERSON OIL CO., INC.
PORTLAND, CONNECTICUT

F. E. Anderson Oil Co., Inc., Box 215, Portland, Connecticut

☐ Send me the leaflet, "Case Histories of Lusol at Work" and any other data.

Name_____ Title_____

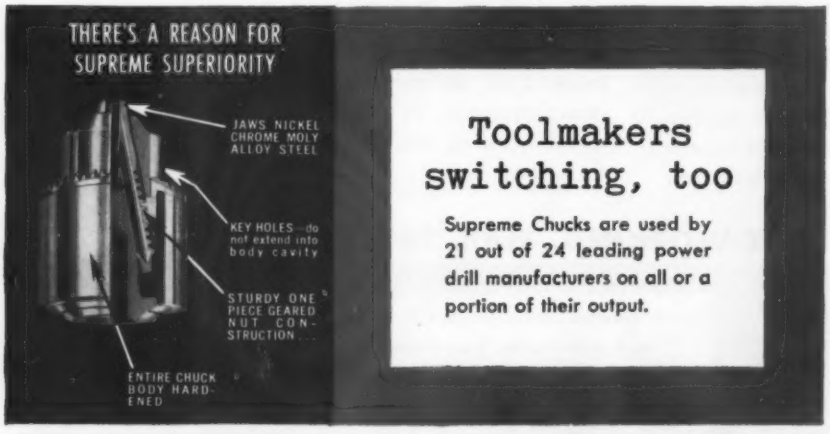
Company_____

Address_____

☐ Have your man call to discuss arrangements for installing Lusol All-Chemical Coolant in the machines selected for this test. ( )

This is the kind of testimonial we get every day on our Supreme Brand Chucks. Users report getting more production, more accurate work, more all-around satisfactory performance from Supreme. One fellow down in Texas even writes that he removes all chucks except Supreme that come on new tools he buys and replaces them with Supreme. He says—"We do some tough jobs and only from Supreme Chucks do we get really top service."

This kind of enthusiasm warrants your attention. Ask your distributor to let you try a Supreme Brand Chuck on one of your own machines. You'll find out in a hurry why more and more tool experts are saying—"Supreme is the best chuck made."


THERE'S A REASON FOR SUPREME SUPERIORITY
JAWS NICKEL CHROME MOLY ALLOY STEEL
KEY HOLES—do not extend into body cavity
STURDY ONE PIECE GEARED NUT CONSTRUCTION
ENTIRE CHUCK BODY HARDENED
Toolmakers switching, too
Supreme Chucks are used by 21 out of 24 leading power drill manufacturers on all or a portion of their output.

Supreme Chucks
BRAND
2222 S. Calumet Ave., Chicago 16, Illinois

find any man less reliable in his work, he should tell the foreman about it, and he in his turn should give the man proper instruction. If he then would still turn out scrap, he might have to give him some less difficult work, or if he was unfit for mechanical work, tell him to sweep the floor, or leave.

Ed is wrong when he says that Al should be content, throw the junk out and not inquire too closely. He should certainly inquire, but it depends so much upon how and when he does it. It is also a part of any foreman's duty to try to prevent scrap being made. Hunting the men down afterwards costs too much both for the company and the guys convicted. Making a show of looking it over is also too expensive.

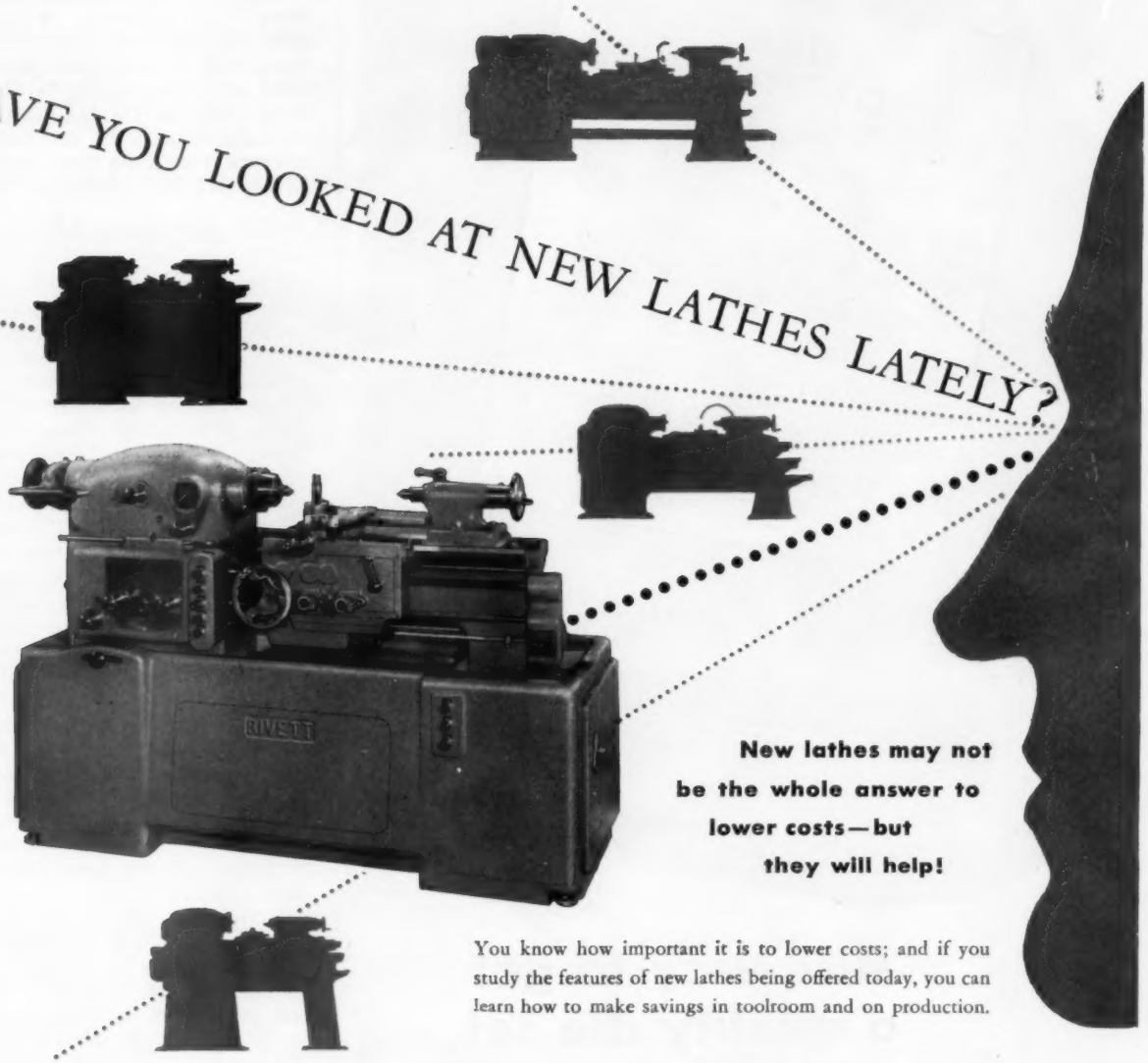
Of course, Al should never bawl anyone out for unintentional mistakes. Only if a fellow is producing scrap because of carelessness should he dress the offender down. If a man spoils a detail he should be told in a friendly way to be more careful. Chances are he'll never spoil a piece again, and no bad feelings remain. If the man is brutally treated a thorn will be left in his heart and remain there as long as he serves under that foreman.

But to uphold the quality and quantity in any production a certain pressure is necessary. The foreman who knows how much that pressure must be, and where and how to apply it, is a real asset to any company. There will always be some discontented guys everywhere, no matter how well they are treated, but such discontent should be ignored. Any crew should be handled so that the majority of them are with the foreman, not against him.

Unfortunately some foremen who are entirely unfit for their jobs sometimes have great powers any-

"Ham Wilson claims to be an authority on flying saucers . . . says he saw a couple the other day while doing some chiseling . . ."

HAVE YOU LOOKED AT NEW LATHES LATELY?



New lathes may not be the whole answer to lower costs—but they will help!

You know how important it is to lower costs; and if you study the features of new lathes being offered today, you can learn how to make savings in toolroom and on production.

Rivett offers two lathes for one!

This observation is particularly true if you look at the new Rivett Model 1020S Precision Toolroom Lathe. It features sensitivity for turning tolerances within .0004″; and heavy biting ruggedness for a ¼″ cut at .020″ feed in cold rolled steel. In short, it is an instrument lathe and an engine lathe combined to handle any work within its 12½″ swing and 20″ centers.

26 Features Distinguish Rivett 1020S

The Rivett Model 1020S is head and shoulders above any ordinary lathe. Its design includes 26 individual qualities that substantiate Rivett's reputation for extreme precision and economical production.

Write for free catalog

Why not write for the new Rivett Catalog 1020B and read these important 26 features—compare them with the designs of other makes of lathes—and thereby realize what a Rivett can do for your shop in the way of time and money (not to mention how happy it will make any *real* machinist to work with such *real* precision!)

RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. AMR 1, BRIGHTON 35, BOSTON, MASS.

USE
DETROIT
DIE SET
DIE SET NO. OR STYLE SSD-2
DIE SPACE "A" 45" "B" 30"
THICKNESS OF SHOE "C" 3"
THICKNESS OF PUNCH "D" 3"
DIA. OF SHANK NO shank
LENGTH OF PIN 12"
STYLE OF BUSH Steel Shoulder
PREC. OR COMM'L Precision
JOB NO. 5-1044
sure way to get
a quality die set
"USE DETROIT DIE SET," stamped on your blueprint, means you have specified a die set for accurate die work, fast mounting and long life . . . because of Detroit's high standard of factory-built and factory-tested precision.
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DIE SET
CORPORATION
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DETROIT DIE SET CORPORATION
2895 W. GRAND BOULEVARD • DETROIT 2, MICHIGAN

way. They hire and fire to their own content, but the company pays the price. When a foreman of that type goes out with his blunderbuss to hunt down alleged sluggards, conditions will improve until he turns his back only. But if the men know their foreman to be fair and considerate, they'll do their best even if they are not hunted.

A E Fristedt
Stockholm-Bromma, Sweden

•

SPOILED WORK is definitely a foreman responsibility. A supervisor cannot ignore the existence and cause of work spoilage but, on the other hand, he should not assume a vengeful and vindictive investigatory course of action in this respect. The latter action is hardly indicative of good foremanship.

It is hardly an adult action on the foreman's part to run out and accuse workers of plotting to produce scrap. The mature foreman will get the facts first before blowing his top in vain recriminations and possible unjust accusations against his workers. Facts will resolve the problem of scrapped work to the mutual satisfaction of foreman and worker. Let the facts decide the question. The foreman should search for facts in preference to opinions, especially emotional opinions. If he has the respect of his men, the facts will be forthcoming from them; they will have no conflict in their minds about the right or wrong of revealing spoiled work to their foreman.

Unfortunately, a great deal of spoilage is caused by ignorance on the part of the worker in correct methods of doing the work. This can and should be corrected by adequate training and detailed instruction. Another condition that leads to hiding of spoiled work is the tendency on the part of some workers to fear punishment or dismissal for spoilage without an opportunity to explain circumstances that may have made the spoilage unavoidable. The foreman should assure all workers that normal scrap is unavoidable, and will be accepted fairly if admitted in good faith. He should make it clear to them that they will get fair and unbiased treatment if they play fair with him in bringing spoiled work to his attention. It's the lack of understanding and trust between the worker and foreman that results in the reprehensible "muff and stuff" action on the part of the worker.

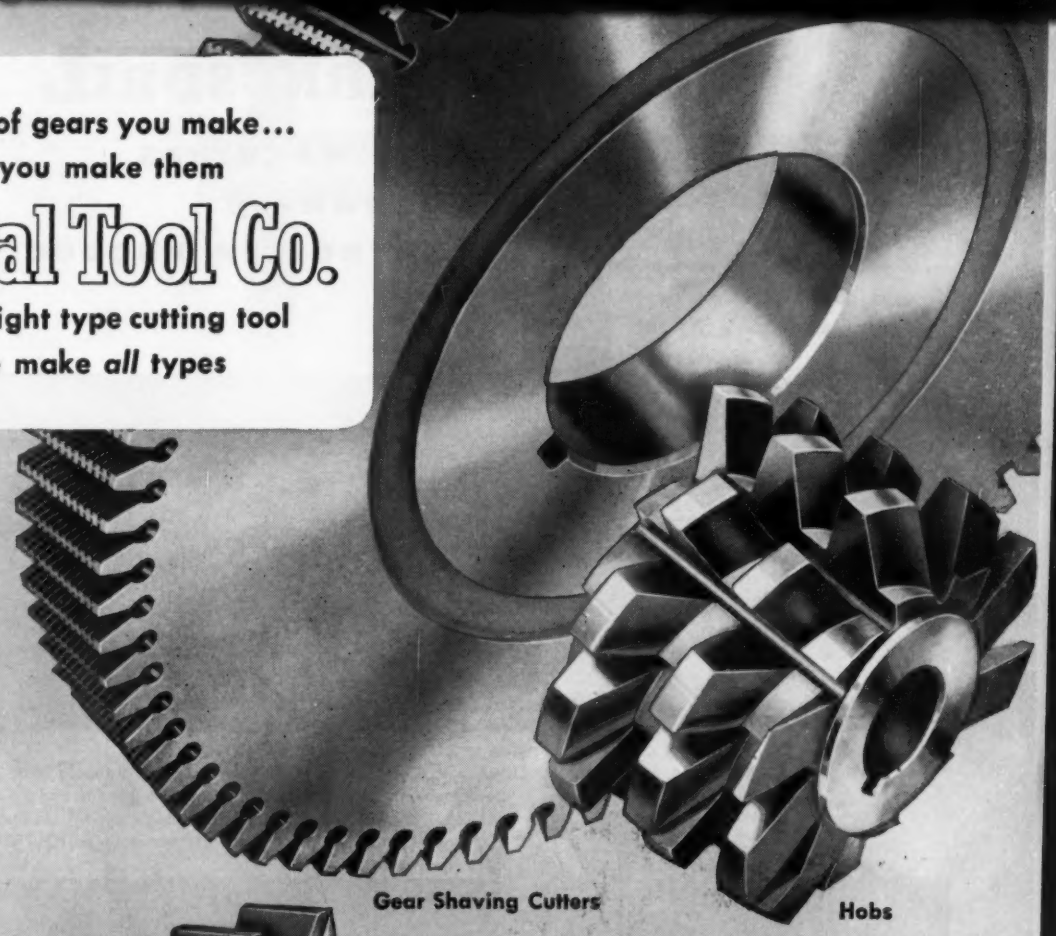
An efficiently functioning inspection department will provide specific and concrete facts that point in the direction of improvement and enable the foreman to map steps toward

Whatever kind of gears you make...
Whatever way you make them

National Tool Co.

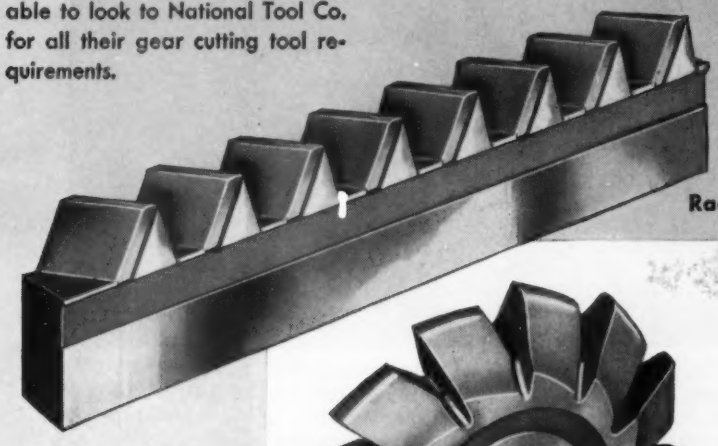
can supply the right type cutting tool
because we make *all* types

National Tool Co., with 50 years experience in the manufacture of special cutting tools, makes *all* varieties of gear cutting tools for *all* types of spur, helical and worm gears—as well as for sprockets and splines. Whatever your gear requirements—large or small—National engineers can help you decide the most efficient method of producing them. Many gear manufacturers have found it profitable to look to National Tool Co. for all their gear cutting tool requirements.



Gear Shaving Cutters

Hobs



Rack Type Gear Shaper Cutters

Gear Shaper Cutters

Involute Gear Cutters

Master Gears

Herringbone Gear Cutters

Representatives in major industrial centers

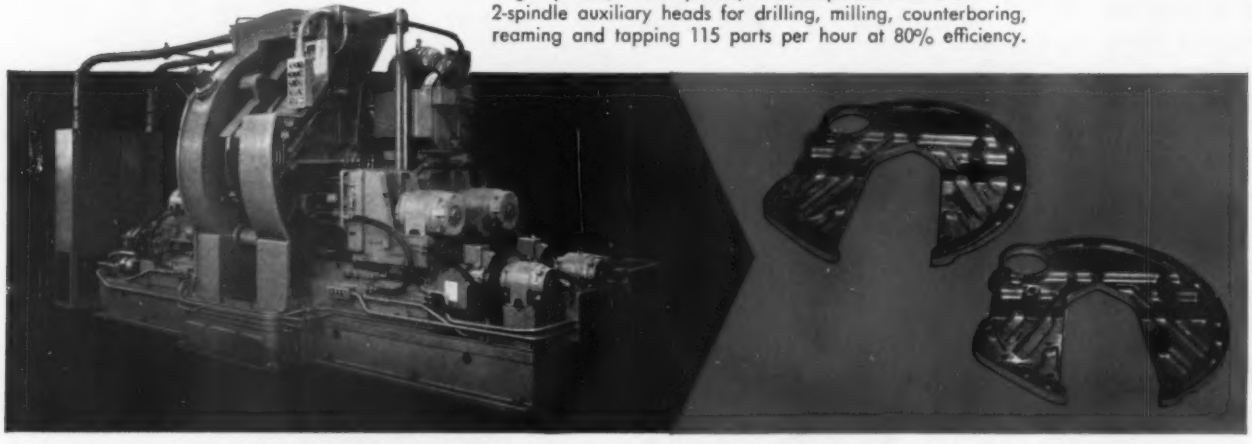
National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

BARNESDRIL

UNIT MACHINES
GUARANTEE
CONTROLLED PRODUCTION-RATE

BARNESDRIL SPECIAL UNIT-MACHINE with 6-station rotary index. Machine is tooled with 2 single-spindle, two 4-spindle, one 16-spindle and one 2-spindle auxiliary heads for drilling, milling, counterboring, reaming and tapping 115 parts per hour at 80% efficiency.



BARNESDRIL SPECIAL DOUBLE-END TRUNNION MACHINE for drilling, chamfering and tapping holes in aluminum housing adaptor plate at the rate of 70 parts per hour, 80% efficiency. Tooling includes two 16-spindle, one 11-spindle and one 10-spindle auxiliary head, and one 6-spindle and one 13-spindle lead screw tapping units.

send for complete catalog, bulletin 1504

These are Typical Examples —
of BarnesdriL Engineering Skill in combining a specified number of production operations into a single automatic cycle, to produce a required rate of production.
A wide range of work operations is available through the flexibility of rotary index, lateral index, drum index or work transfer mechanisms. Units adapt themselves to vertical, horizontal or angular arrangement. Call your BarnesdriL representative for recommendations on your production-rate problems.

HOLE BARNESDRIL FINISHING

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

reduction and elimination of spoiled work. The aim of an inspection department is to determine the percentage of defective product being turned out and the causes. Defective and spoiled work can then be charged to the proper source; materials, machines, methods, or men. Knowing that inspection for quality is done gives the worker a healthy respect for kind as well as amount of output, and thereby combats carelessness and spoilage. Any inspection system, whether it be an organized inspection department or the foreman's own methods, should certainly provide for tracing defects to the individual worker who caused them, and should provide some means of insurance against their recurrence. Such methods tend to make workers their own inspectors, and provide better results in reduction of scrap.

Another method for educating the workers as to the costs of scrap and the causes are by exhibits which may help to avoid similar mistakes in the future. In order to impress employees with the importance of cutting down on scrap and waste, one company I know of exhibits spoiled work in the plant and in its employee paper, with the dollars-and-cents cost in big figures. The attention directed to the monetary cost has a sobering effect. It is also emphasized that quality is never an accident. It is the result of discriminating judgment and care which is brought to skillful execution through sincere effort. Reduction of spoiled work is also related to the fact that employees are human beings who respond favorably to treatment as individuals. Good relations create confidence and make workers quality-minded.

The reduction of spoiled work can be dramatized effectively in the following manner. One plant, in its quality control and spoilage reduction campaign, went in for plenty of visualization. It had a realistic

"Mustard?"

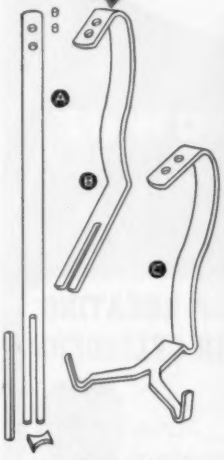
top performance IN MASS PRODUCTION

60 vaporizer stands per minute . . . automatically formed in one operation on an A. H. Nilson combination press and 4-slide. Kaz Vaporizer stands are a proof that clever product design, combined with precision tooling by Nilson, increases production and lowers costs.

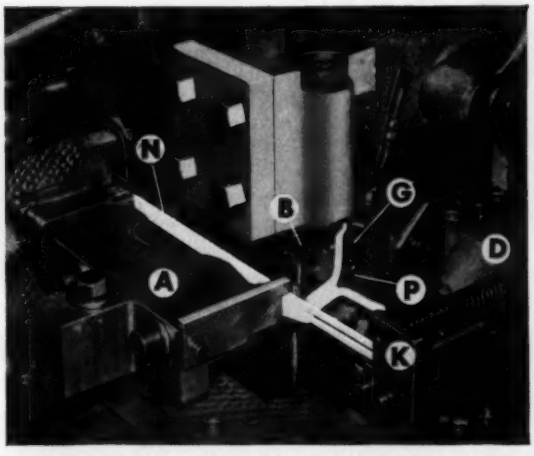
NILSON 4-SLIDES FEATURE—

- ONE-MAN OPERATION
- FORMING OF WIRE OR RIBBON METALS FROM THE COIL
- ONE FAST, AUTOMATIC OPERATION WHICH STRAIGHTENS, FEEDS, PIERCES, BLANKS, SWAGES, STAMPS OR COINS, CUTS OFF, FORMS
- CRITICAL TOLERANCES UP TO .002 ON ANY RUNS
- FAST TOOL AND DIE CHANGING
- WIDE SIZE RANGE—FORMS WIRE UP TO ½ IN. DIA. IN FEEDS TO 32 IN. MAX. AND RIBBON STOCK UP TO 3½ IN. WIDE
- PRESS SECTIONS—5 TO 30 TON CAP.
- HEAVY DUTY MODELS—50 AND 75 TON CAP.

Without obligation, Nilson provides specific forming recommendations from detailed information. Send for A. H. Nilson catalogue . . . the first step to increased production.



Stand is zinc-plated steel strip 0.05 in. thick by 0.625 in. wide . . . made in steps A, B and C.

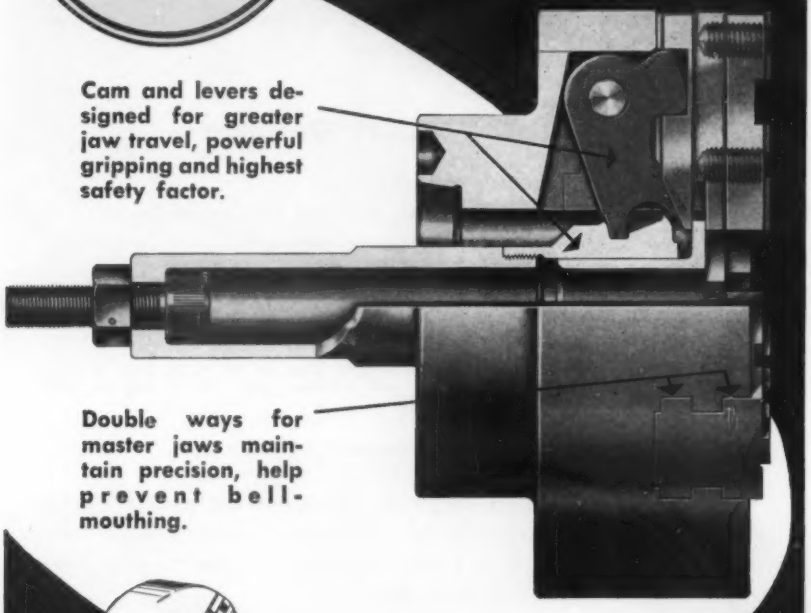


Final step in forming Kaz stands on Nilson 4-slide. Feet are spread, bent, crimped (G) with workpiece (P) on centerpost while next piece (N) is being cut off. Stop (K) on right slide (D) backs off after cut and workpiece (P) is wrapped around centerpost by die (A) when finished part is clear.

A.H. NILSON MACHINE COMPANY

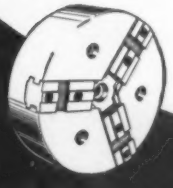
1519 RAILROAD AVE. BRIDGEPORT 5, CONN.

POWER CHUCKS



Cam and levers designed for greater jaw travel, powerful gripping and highest safety factor.

Double ways for master jaws maintain precision, help prevent bell-mouthing.



More gripping power

Famous S-P cam and lever design holds the work tighter, permits cost-cutting heavy feeds and multiple cuts. Cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure . . . an important safety factor.

Installed as original equipment by Bardons & Oliver, Cleveland Automatic, Cone Automatic, Ex-Cell-O, Monarch, Warner & Swasey . . . many others.

Representatives in principal cities. Prompt deliveries. Send for Catalog 105. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

S-P ROTATING AIR CYLINDERS

Piston packings "replace" themselves, cut downtime. Send for Catalog 105.

THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916

AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
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"quality show" in each department. Examples of defective and spoiled work done in the particular department were mounted next to good quality output. The defects and how they were corrected were highlighted. Also underscored were the causes of the defective jobs—carelessness, sloppy work and poor judgment. In order to imbue all workers with quality-mindedness, they were impressed with the theme that every worker contributed to the final product. It was hammered home that a defect in any part of the operation showed up in the final product, and thereby threatened every employee's security.

Coming back to the personalities involved in the case under discussion, Ed's advice to Al that he is headed for trouble if he goes looking for the perpetrators and causes of spoiled work, and his admonition to just be content to throw the scrap out, and not inquire too closely into why and by whom the parts were ruined, is deceptive reasoning.

Harry Kaufman
Philadelphia, Pa

•

NO FOREMAN should vengefully track down workers who spoil work, and no foreman should forget, or pretend to forget, that work has been spoiled. To be vengeful is juvenile, and there is no place in modern industry for the juvenile or vengeful foreman. To forget about spoiled work or to pretend to forget about it, is simply to run away from a problem and is an indication of bad housekeeping. Both of those reactions are wrong in a foreman and cannot be too severely condemmed. The foreman who is all out for maximum production must take notice of all shop happenings, notably those likely to slow down or defeat that objective.

The sensible foreman would not, of course, be vengeful concerning any of his men, however careless they might be. His job is not to be vengeful, but to be constructive and helpful, to maintain and increase output by so arranging his section that the highest skill and most dependable operators are employed on the most important work. The highest skill on the lowest tolerances should be a first principle with foremen.

In dealing with careless spoilage, it is the foreman's first task to try out corrective methods, preceded by a straight talk on the iniquity of carelessness and the folly of earning a reputation for low-grade performance. The state of the labor market in the town or district concerned will shape the correctional

MUELLER BRASS CO.

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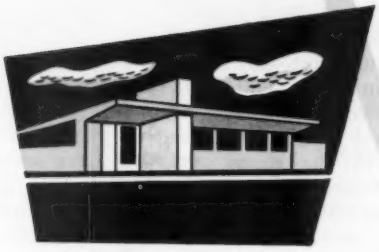
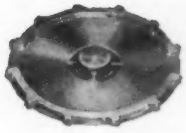
ARE MADE TO LAST!

QUALITY PARTS AND PRODUCTS FORGED AND MACHINED OF BRASS, BRONZE AND ALUMINUM OR MAGNESIUM



IN THE HOME



IMPELLER DISPOSER

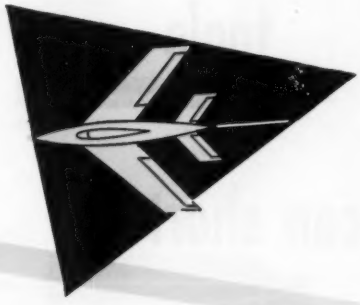
One of four Mueller Brass Co. parts in modern waste disposal unit. Completely dependable in daily operation.

WINDOW HARDWARE

Forged of natural bronze. Can be furnished in aluminum or chrome finish as desired. Retains original beauty indefinitely.

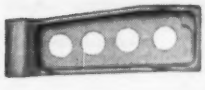
BURNER HEAD

Forged of aluminum for installation in gas stove. Lightweight yet strong.



IN AVIATION

LANDING GEAR TORQUE ARM



SUPPORT MEMBER

INSTRUMENT HOUSING

These aluminum forgings provide the same strength as steel yet weigh only 1/3 as much. Smooth bright surfaces save machining time and eliminate costly finishing.

Specially designed forged housing for sealing diaphragm in aviation pressure warning unit.

IN INDUSTRY

CONNECTING ROD

Forged from "600" series metal. Over two million connecting rods produced without recorded failure.

ACTUATING GEAR

Forged from special Mueller Brass Co. alloy. Must take constant pounding.

AUTOMOTIVE GEAR

Forged of "600" series metal for use in automotive automatic transmission. Replaced part that was giving constant trouble; solved costly problem.

All Mueller Brass Co. forgings, of which just a few are shown here, have a dense, close-grained structure with a high tensile strength. Weight savings up to 40% are possible in the design of parts because of the close tolerances to which they can be produced. Less scrap and longer tool life result from the easy machinability of forged parts. Mueller Brass Co. is completely equipped to design parts for your products, specify alloys (including special alloys developed by our metallurgists), forge, machine, finish and plate the parts and perform all necessary assembly operations. Write today for our free illustrated 32-page forgings catalog and complete information about MBCo forged parts for your products.

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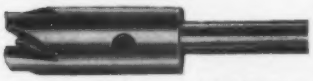
Which



HOLLOW MILL

of these

STEP DRILL

multi-operation

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tools

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can short-cut

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FOUR-STEP REAMER

machine time?

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Woodruff & Stokes design and produce small precision cutting tools to do, in a single operation, work often requiring as many as five separate machinings. Small, intricate holes of extremely close tolerances can be made quickly, easily, with W&S tools specially designed for each cutting problem. Let us tackle *your* problem—we may save you much valuable time.

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talk. If skill is reasonably plentiful, the straight talk can carry the suggestion of a punch; if it is difficult to come by, the talk should be on mildly soothing lines, assisted by generous doses of instructional supervision and with an eagle eye on quality rather than quantity, for the time being. Appealing to a man's vanity can, on occasions, have a salutary effect, resulting in a gratifying improvement. When the lessons on quality have taken root, attention can then be directed to quantity.

Regarding the second point—saying nothing to the men about spoilage—Ed is here preaching a gospel of despair which would simply encourage carelessness in the shops and earn for the foreman the contempt of those he is paid to control, guide, and inspire. A foreman must never boggle, he must make firm decisions and on time; "jelly" in a foreman is "jam" to the troublemakers, almost any decision is better than prolonged indecision.

The live foreman will, naturally, give heed to the information furnished by time cards and inspection department, with a critical eye on good intentions, but mere dependence on other sections is not nearly enough. Something much more intimate, more positive, is required of him. Unless he has more men than he can properly supervise, no spoiled or defective work should escape the foreman's notice. If he is where he should always be—on the shop floor, and not confined to an office—wrestling with paper work which others less-skilled could and should do, no job should "disappear," to be later dug out, without his knowledge.

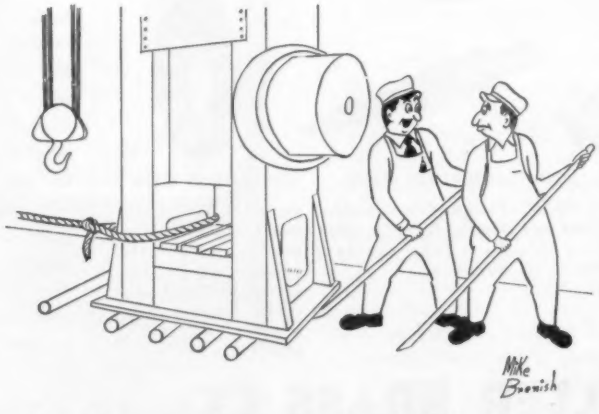
Admittedly, if a foreman is employed on mass production, supervising a shopful of automatics on small part work, the chances of spoilage without the foreman being aware of it are vastly increased. Spoilage, in that case, can result from bad setting or poor material or from a number of causes not connected with the operator. In such circumstances the foreman would lean more heavily on inspection and time and material cards than were he employed on general production when highly-skilled and not semi-skilled labor would be the rule rather than the exception.

M Donald
Lanarkshire, Scotland

IN A DECENTLY ORGANIZED manufacturing unit there should be no necessity for the foreman to track down workers who have scrapped material; it should be self-evident. If a man has been given ten pieces of material, he should be expected to turn into Inspection ten finished components. If he scraps one of the pieces, how does he manage to sneak an extra piece from materials stores with which to remake a scrapped part? Any firm who allows such light treatment of materials ought to tighten up on its internal organization because if it is so easy to obtain material for reworking scrapped parts, then it should be just as easy to permit material to be pilfered.

Scrapped work can be cured like a lot of other bad habits and the way to cure it is by constant vigilance. If executives do not take the trouble to investigate scrapped work, then a general attitude of carelessness will be promoted in machine operators who will begin to relax their vigilance. If the foreman does not care if material is spoiled, how can the operator be expected to worry about it?

If scrap is to be hidden when it occurs it becomes evident that the operator is afraid of the consequences, because scrap has a bad habit of coming to light again. In fact, scrap engineering components



"I'm really a white-collar executive, I just do this for money . . ."

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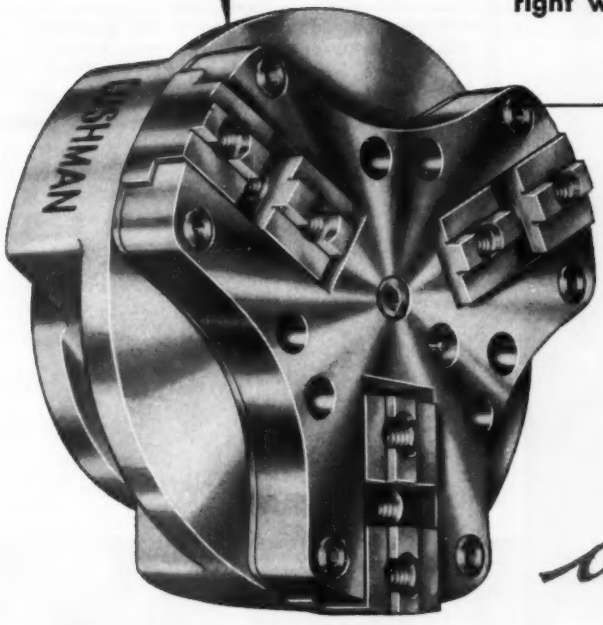
gives you CHUCK-ABILITY

CHUCK-ABILITY: **The ability to SPEED your work ... IMPROVE your products ... and REDUCE your costs ... through design and selection of the right work-holding devices**



Remember–
You can't machine it economically unless you hold it right

an example

. . . is Cushman's Aluminum Body Wedge-Type Air Operated Chuck, the answer to industry's demand for a lightweight, low inertia chuck for high speed machine tools. The surface of all parts subject to wear are of hardened steel.

To find out what Chuck-Ability can do for you, write Cushman for Catalog No. PO-64-1953 fully describing and illustrating Cushman Air Operated Chucks, Cylinders and Accessory Equipment; or, should you have a special work-holding problem, consult the Cushman Engineering Department.

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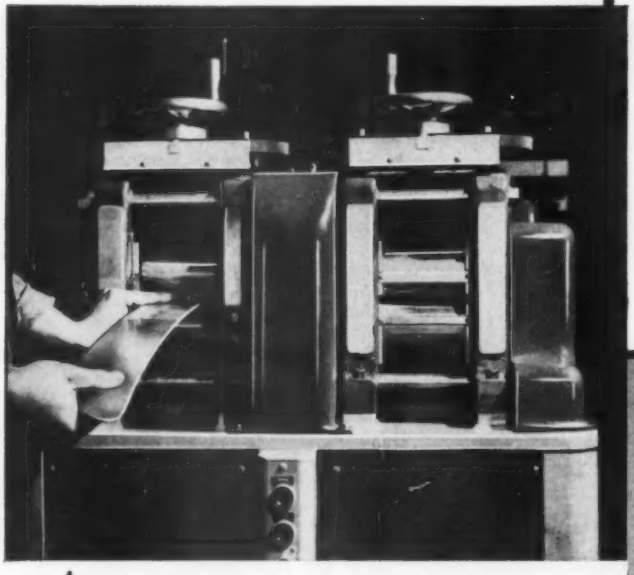
The MEEHANITE® Casting Reporter

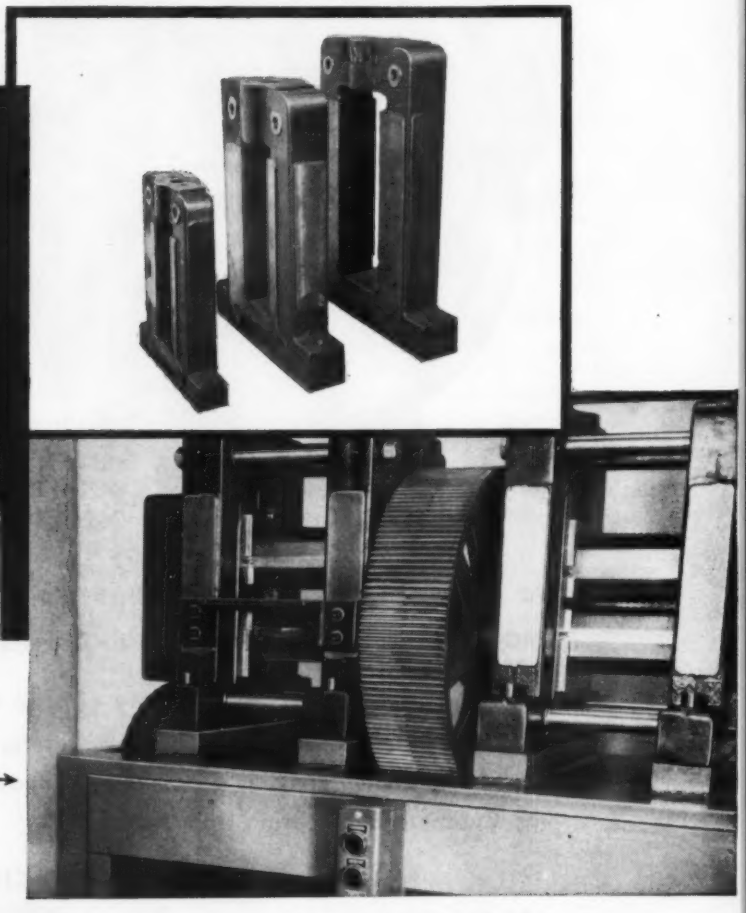
3 PROBLEMS SOLVED IN STANAT MILLS

The Stanat Manufacturing Company, Long Island City, New York, produce a line of small rolling mills used in both laboratory and industrial production. Three fundamental problems in the design and manufacture of these mills were encountered and solved as follows:

	PROBLEM	SOLUTION
1.	Subjection of frames to unpredictable stresses and shock in service.	Strong, tough, rigid Meehanite frames.
2.	Roll leveler—a unit for leveling strip stock up to 3/16" thick. Wide speed ranges and changing types of material impose intermittent shock loads.	Pressure lubrication achieved by rifle drilling Meehanite frames. Meehanite housings for pinch roll bearings for long life and soundness.
3.	Bull gear breakage—an unexpected application by customer resulted in gear breakage.	Bull gear redesigned to use heat treated Meehanite castings. No further breakage.



Stanat three-inch combination mill assembled for rolling both flat and wire stock.



Heat treated Meehanite bull gears eliminated breakage in service. →

BUILDER SAYS:

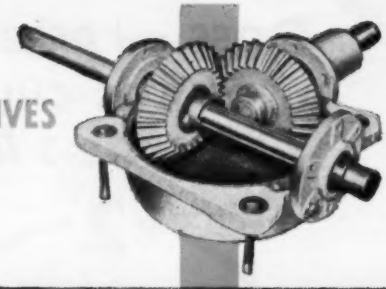
"Generally, we use Meehanite castings for parts subject to high stress, heavy shock loading or where we desire dimensional stability during machining. Also, we use special heat treatable types of Meehanite metal in applications such as gears, and for rolls used in our mills for hot rolling.

The use of the Meehanite castings gives us greater design freedom, makes for more compact sizes and gives a product that we know will stand up to anything that can be reasonably be asked of a mill."

WHAT MEEHANITE CASTINGS HAVE DONE FOR THEM

MEEHANITE GEARS

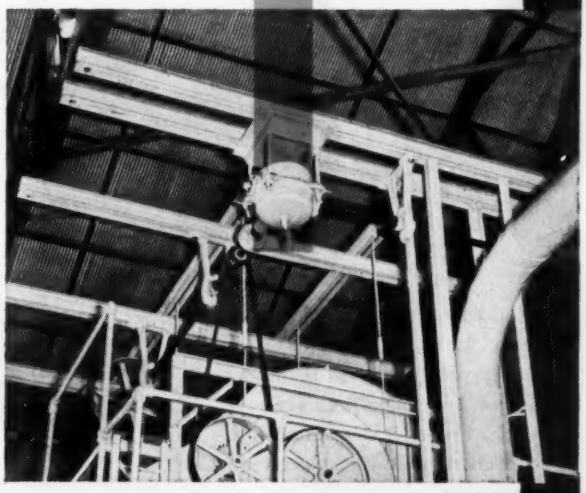
REPLACE FORGED STEEL IN COTTON GIN DRIVES



The Lummus Cotton Gin Company, Columbus, Georgia, achieved major machining and material economies by specifying Meehanite gear blanks when manufacturing the drive mechanism shown.

Formerly cut from a solid forged steel billet, redesign, after a study of the engineering properties available in Meehanite metal, developed a gear blank from which the drive gears were machined.

The unit as indicated, is a drive for a tramper countershaft on a cotton gin and operates not only the tramper, but in some cases, hydraulic pumps for the presses and is driven by a 30 HP motor.



BUILDER SAYS:

"We thus achieved not only a substantial saving in machining time and material, but operational noise was reduced because of the high vibration damping quality of the Meehanite gears."

ONLY A MEEHANITE FOUNDRY CAN MAKE MEEHANITE CASTINGS

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington and Dover, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio & Grove City, Pa.
De Laval Steam Turbine Co.	Trenton, New Jersey
M. H. Detrick Co.	Newark, N. J. and Peoria, Ill.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Georgian Iron Works Co.	Augusta, Ga.
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
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Lincoln Foundry Corp.	Los Angeles, California
Palmyra Foundry Co., Inc.	Palmyra, New Jersey
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
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Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
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Sonith Industries, Inc.	Indianapolis, Ind.
Southern Illinois Foundry Co.	Carmi, Ill.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Vulcan Foundry Company	Oakland, California
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey
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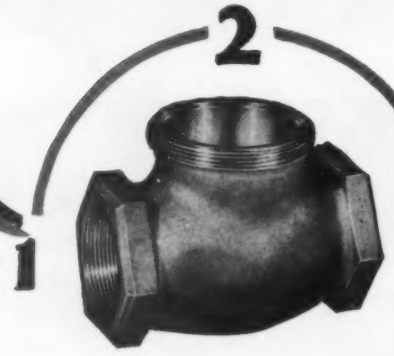
This Advertisement Sponsored by Foundries listed above

MEEHANITE METAL® CORP.

714 North Ave., New Rochelle, N. Y.

ONLY

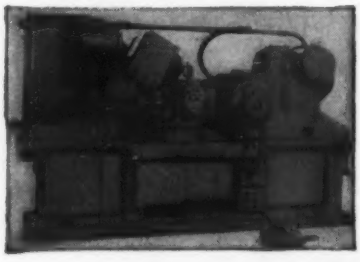
GOSS and DeLEEUW AUTOMATIC CHUCKERS offer the 1-2-3 feature



This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.



The examples of work shown here are typical of the wide variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DeLEEUW

GOSS and DE LEEUW MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

will not remain hidden for long; like murder, it will out, and to quote Shakespeare, "Will speak with most miraculous organ."

The persistent scrapper of jobs must be known to the foreman so that he can be kept off work which is tricky or which involves the use of valuable materials. He must also never be given an urgent piece of work to do because such men have a penchant for scrapping the most urgently needed piece. Even the best and most reliable operators will have temporary lapses and will scrap a piece of work. It is useless to berate such men; it is much better for the foreman to suffer the delay or cost of spoilage with good grace, but he should hold a postmortem on the piece of scrap to find out why it happened.

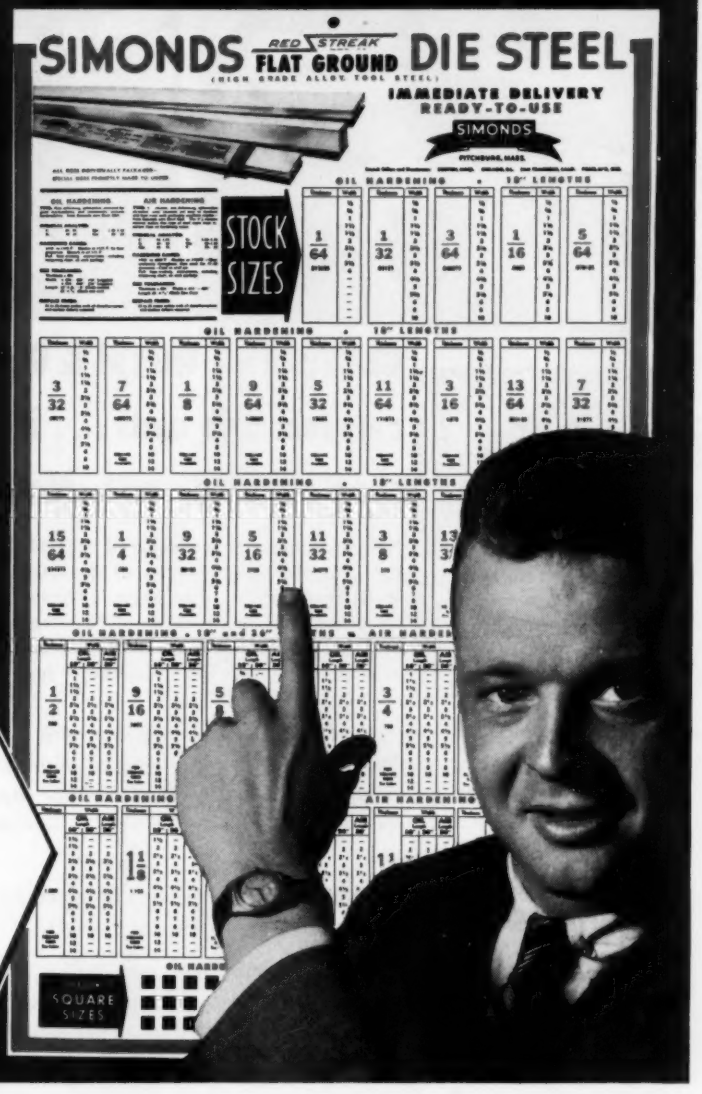
Reasons for scrapping work are very involved. When it is a case of the reliable operator forgetting whether to push or pull a machine control at the crucial moment, then nothing can be done about it. If the operator has a reasonable excuse, it should be considered; perhaps the blueprint was dirty or downright misleading.

Was there sufficient information on the drawing, or did the operator have to stop his machine and make calculations in order to obtain a needed dimension which came out wrong? This should not be allowed; any drawing that needs calculations for its correct reading should be returned to the draftsman for completion.

I fail to see how Inspection can keep scrap costs down. They can only inspect what they are offered and they can only accept or reject work according to their interpretation of the component drawing. If Inspection is persuaded by Production to let defective work pass through, then the Inspection Department might as

". . . Pretty good sized machine you're designing, eh, Mac?"

Look at all the NEW STOCK SIZES of Flat Ground Die Steel



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CLEVELAND WORM & GEAR CO.

cuts tool crib costs . . . increases shop efficiency with McCASKEY

Numerous benefits are secured thru McCaskey Tool Crib Control in the plants of the Cleveland Worm & Gear Company and their affiliate, The Farval Corporation, manufacturer of "Centralized Systems of Lubrication." Mr. Edward F. Mason, Tool Engineer of both, recently reported a few as follows:

"When the McCaskey system (shown in the illustrations) was installed, we discovered we were overstocked with tools not often used and understocked on some in regular use. A large part of our Worm & Gear production is custom-made, but with the information now available, emergency tool orders are practically eliminated.

"Prevention of hoarding by some of our employees has increased the number of tools available for others without additional purchases.

"Tool Location Boards show at a glance where each tool is stored in the crib. As a result, tools seldom are lost or mislaid and waiting time at the crib window and production delays are reduced to a minimum.

"Our Broken Tool Reports are analyzed as an indication of trouble. Any unusual breakage is reported to the proper department for investigation and total breakage has been cut to a very small figure.

"These and numerous other benefits from the McCaskey installations made in 1942 and 1946 continue to provide lower operating costs in the tool cribs and increased efficiency in the shops."

McCaskey Tool Crib, Gage and Blueprint Controls offer you comparable "benefits" regardless of the size of your plant or your products.

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Please send me all the facts concerning McCaskey Tool Control ☐; Gage Control ☐; Blue Print Control ☐.

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Galt, Ontario, Canada

well be disbanded. Inspection should be allowed to exercise dispassionate judgment on the work offered to them by Production Departments. It is an old trick to complain that Inspection is holding up the job by rejecting it; the simple answer is for the production shop to pull up its metaphorical socks and turn in work that is correct to drawing.

Any shop that is suffering from a rash of scrapped jobs should have a serious talk with the offending operators. The approach should be objective so as to find out if remedial steps can be taken to prevent a repetition of the trouble. If the operator has been careless, he should be informed that he has committed a serious offense. Only by taking note of each piece of scrap and informing the operator that he is responsible for it will any tightening-up of the work standards in the shop be achieved. But the operator should not be placed in such a state of terror that he has to bury the offending piece of work. Furthermore, the opportunities for the disposal of stillborn jobs within the plant should be strictly limited. For instance, if a convenient canal or creek runs alongside the plant, as it did in a shop where I used to work, wall it off with the highest possible fence of small wire mesh, or brick to dissuade the scrap makers from disposing of spoiled bits and pieces. Keep the scrap out in the open so that it can be discussed and reasons found for its existence.

Clifford T Bower
London, England

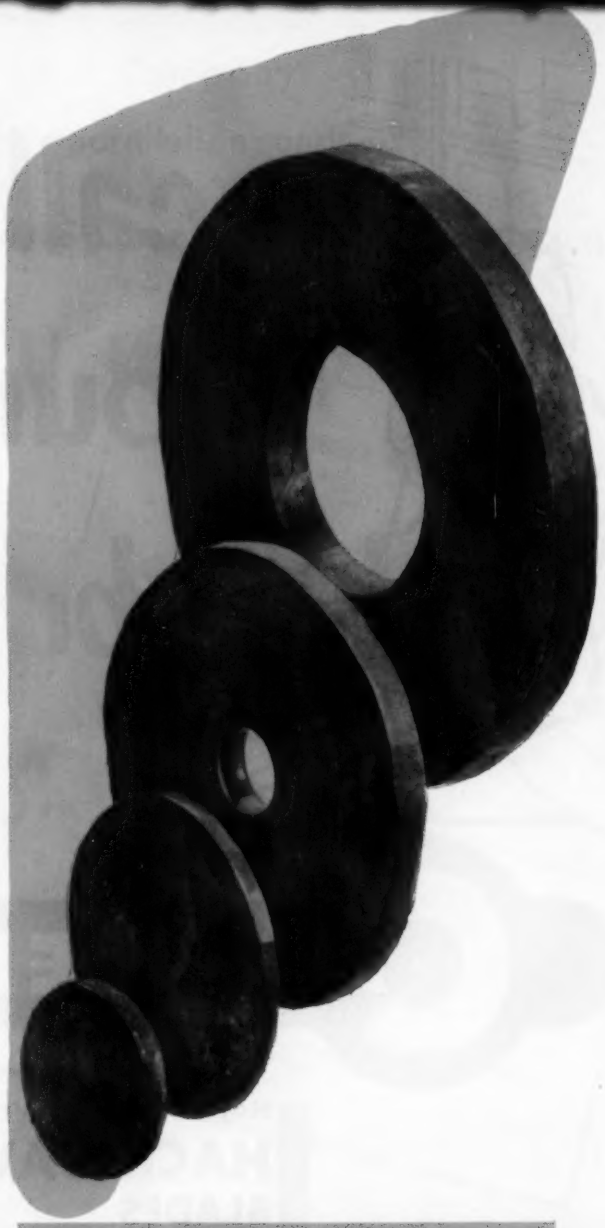
•

A FOREMAN WHO hunts down the man who spoiled a piece of work becomes an object of hate to the men in the shop, a man to be despised and avoided. How can an organization hope to achieve efficient operation with such an attitude existing in the shop? The incentive to produce a good day's work has been displaced. There is no longer a friendly atmosphere, but one of distrust. This makes it extremely difficult for a new employee to become acclimated and to learn the work.

An employee possessed of fear is apprehensive, and a poor worker, afraid to exercise his skill, afraid to apply sufficient pressure to the drill or to take a reasonable cut. And what is of even greater significance, an employee working under this difficulty is afraid to use his most valuable talent, namely his initiative and his ability to think.

When an employee has such a fear of spoiling a part he becomes excessively conservative and keeps

Seam Welding Wheels performance-fitted for your job



Two families of Mallory *seam welding wheels* now give you a choice of operational qualities, from which you can select the type that best matches the performance and economic requirements of your application. Both are available as rough forgings, or finished-machined to your specifications.

For severe service, Mallory cold-forged wheels offer the peak in performance. Special Mallory forging techniques produce a metallurgical structure that has excellent uniformity, hardness and conductivity. Made of a variety of Mallory alloys, these wheels set the highest standards for long life, consistently top welds, and long runs between dressing. Alloys are available for welding all kinds of materials including coated metals, aluminum and magnesium alloys, and stainless steel.

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Let Mallory welding engineers help you choose the type of wheel that your specific application requires. And write today for your copy of the latest Mallory Resistance Welding Catalog . . . or get one from your local Mallory distributor.

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Hundreds of shapes and sizes are available in stock . . . with round water holes or the exclusive Mallory fluted cooling hole for longer life between dressings. Save you both cost and delivery time.

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Odd-shaped electrodes you consider "specials" may well be standard items for Mallory . . . can be made quickly with existing tools, in a wide range of single-bend, double-bend and irregular shapes.

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HAND AND POWER
HACK SAW BLADES

WOOD AND METAL CUTTING
BAND SAW BLADES

GROUND FLAT
TOOL STEEL

CARPENTERS' — MACHINISTS'
HAMMERS

PIPE TOOLS

THE CAPEWELL MANUFACTURING CO.
65 GOVERNOR STREET HARTFORD, CONNECTICUT
ICA55

checking and re-checking with a resultant loss of production. Working in this environment of fear causes an employee to lose confidence in himself. It is impossible to be happy under these conditions. The foreman and employees are constantly at odds with each other. The foreman may think he is winning the fight—and he may be winning, but it is the organization that is paying his salary that is losing.

Henry George
Bronx, NY

•

THE PROBLEM DISCUSSED is one of considerable significance, but usually does not receive the attention it deserves.

I am sure that Ed is right in his attitude toward spoiled work. As a general policy Al should not go out on a manhunt to track down the operator who made the unusable part. If he finds that a certain employee has produced a bad part, he should keep it to himself. Tracking down the source of spoiled work is not in the best interest of the company. The time he spends—and it can be plenty—is time spent unproductively. The feelings and attitudes of the workers will not be improved by this hunting. The foreman should make certain that the employees know that the company is concerned about the number of bad parts produced, but they should also know that the attitude of the company is a reasonable and practical one.

The foreman should not disregard spoilage completely, but the only time he should trace spoiled work is when it becomes excessive, or when he suspects some one person is producing more than his share of scrap. When he finds that such a condition exists he should make every effort to determine the cause of the spoilage. It is very possible that it is not

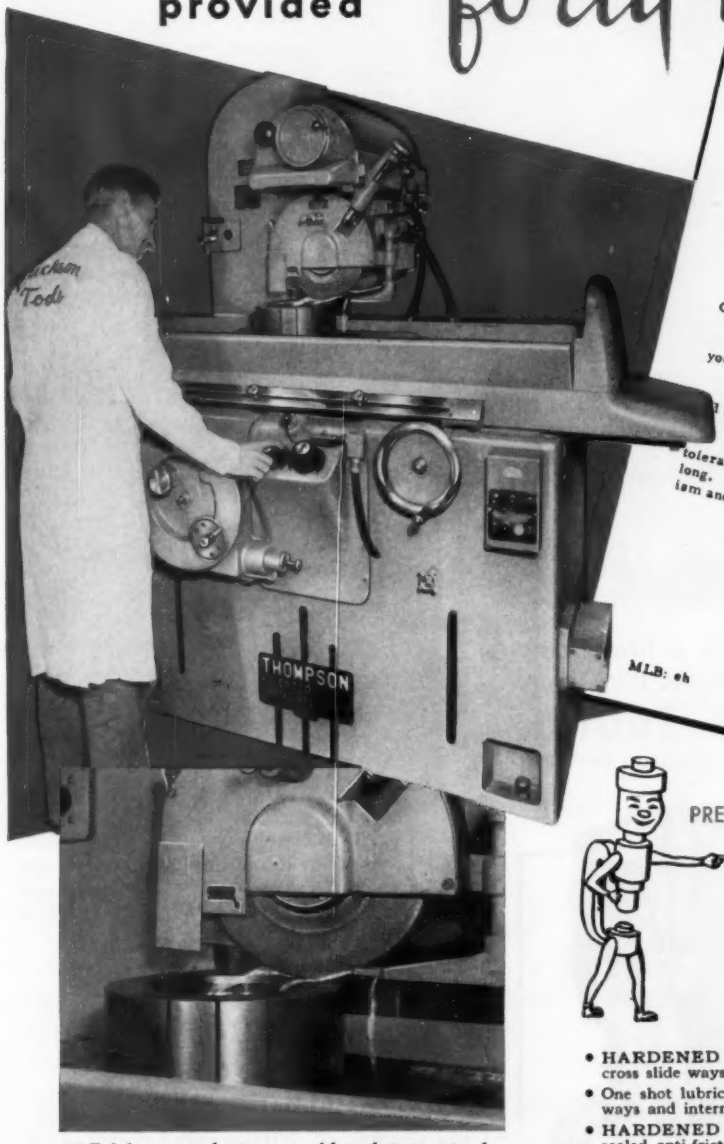
"You told me to gather the top brass for a meeting."

The Erickson Tool Company

asked for at least .0001 for parallelism and size. . .

The Thompson 2F (8x10x24) Super Precision Grinder

provided "forty millionths"



ERICKSON TOOL COMPANY
EAST 23rd AND HAMILTON AVENUE
CLEVELAND 14, OHIO

September 17, 1954

The Thompson Grinder Company
Springfield, Ohio

Attention: Mr. John Wilson,
Vice President.

Gentlemen:

May we take this opportunity to express our satisfaction with your Thompson 2F 8 x 10 x 24 Surface Grinder.

We purchased this grinder on your claim of .0001 for parallelism size. This tolerance is necessary for most of our work.

Upon its arrival we asked a service man to prove this .0001 tolerance, using 5 blocks on a surface of 4 inches wide by 20 inches long. The test blocks showed .00004 (forty millionths) for parallelism and size. This was well within your guarantee.

Yours truly,

ERICKSON TOOL COMPANY

M. L. Benjamin,
President.

MLB: eh

"Erickson products are sold and guaranteed to hold extreme accuracy. It is vital that we have the precision equipment necessary to manufacture these products. Our Thompson 2F Grinder delivers this precision. In the above picture we are grinding a #1200 expanding sleeve and hold within .0001 parallelism and size."

PRECISION PETE says:

"You may be surprised to find that Thompson 2F Grinders cost less than some others and still provide all these features for greater accuracy and longer service. Fast delivery, too!"

- **HARDENED AND GROUND** cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- **HARDENED AND GROUND** sealed anti-friction vertical slide.
- **HARDENED AND GROUND BED WAYS** with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.
- Handy control panel.
- Elevation micrometer stop graduated in .0001"
- **GROUND THREAD FEED SCREW.**
- Automatic wheel **TRUING** device.
- Longitudinal hand feed with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
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- Elevating hand wheel graduated in .0005".

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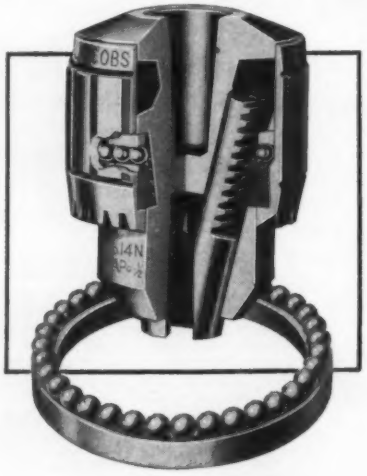
For a **Real Grip** *on things*

Try the Jacobs Ball Bearing Super Chuck. It's a heavy duty chuck for heavy duty drilling . . . a bear for grip and 100% more powerful than comparable plain bearing chucks.

Here's why. The ball thrust bearing rolls away friction between sleeve and nut. Steel jaws close smoothly with tremendous power. The Jacobs Ball Bearing Super Chuck grips harder, and more accurately than any other drill chuck made.



The Super Chuck and the complete line of Jacobs Chucks are stocked and sold by industrial distributors everywhere. See yours, or write Jacobs Mfg. Co., 1601 Jacobs Road, West Hartford 10, Conn. Ask for Catalog 100.

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are ready to deliver the chucks you need and the service you deserve.
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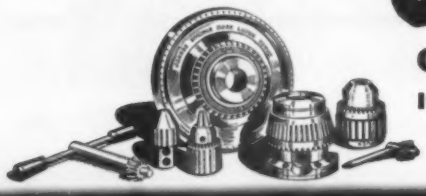


Jacobs
CHUCKS
If it's a Jacobs it holds

the employee's fault. The tooling or machine may be at fault. There are numerous sources of errors, such as worn drill bushings, worn machine spindle, table out-of-square, etc. It is the responsibility of the foreman to check these things before blaming the operator.

There is another good reason for investigating first. The foreman himself may be at fault. He may have given the operator the wrong tool or incorrect or incomplete instructions.

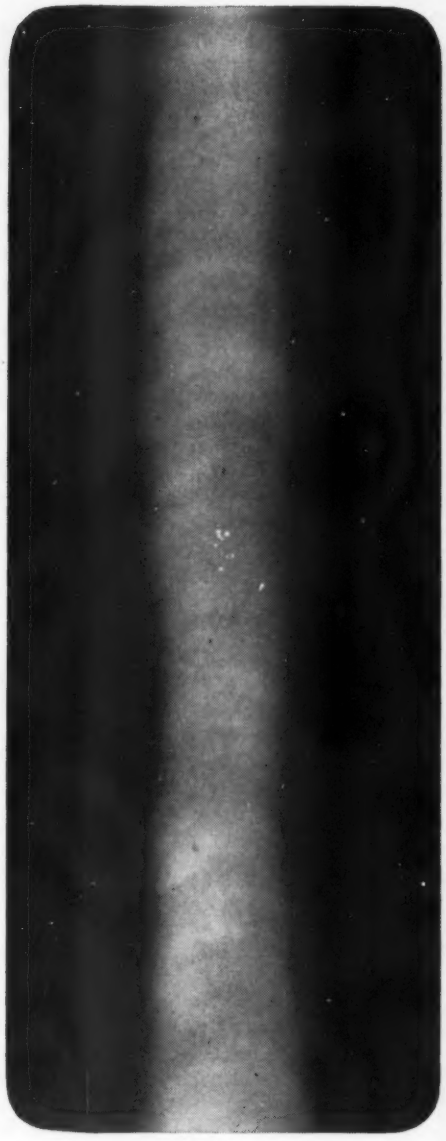
If the scrap is traced to its source with a vengence, the employees will regard it as an unreasonable attitude on the part of the company. The result will be undesirable and detrimental to production because it will create an atmosphere of fear. This condition is a very bad one to have in the shop. If the company instills in the employees this fear of producing a bad part it will result in reduced production because the men become excessively careful and are forced to creep up to the finished size instead of taking a reasonable cut. This fear may cause many employees to struggle and sweat out acceptable parts rather than report difficulties with the tools or machine to the foreman.

We have spoilage in our shop, but our machines are not the gift of a superior being. The machines were designed by human beings, built by human beings, and are operated by human beings, and as such are subject to human errors and human failings.

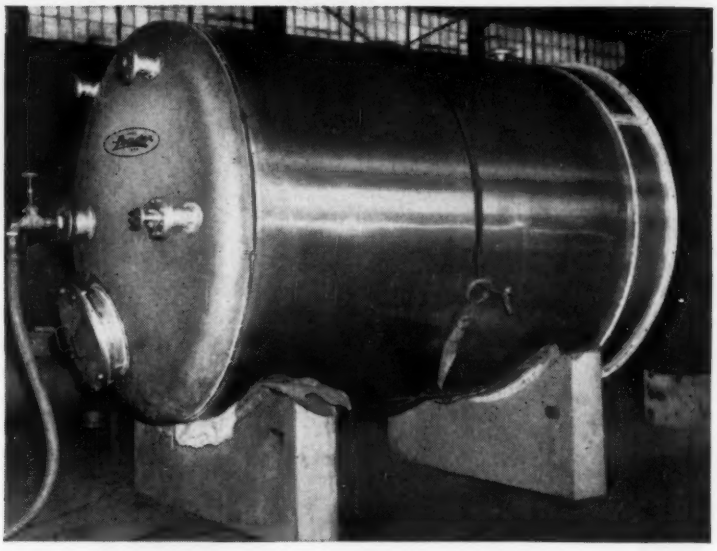
Our men take pride in their work and do not intentionally produce bad parts.

During the war years we employed many women in our shop and they were intensely proud of their work. We never found any bad parts in the shop. They produced bad parts, and we knew it, but we never saw the

". . . . and that's the last one. Thanks for returning them to the tool crib."



RADIOGRAPHY makes positive about negative pressure



Specifications for this tank—designed to operate from vacuum to 25 pounds' pressure—called for welded 2S aluminum. This, as welders know, could cause problems. But the builders called on radiography. Here is what they say:

"X-rays played a very important part in the extensive research to determine the most suitable method of welding the vessel. Without the use of x-ray we might never have obtained the high quality and uniform results."

Which shows two important facts. First, that radiography proves the soundness of welds. Second, that it expands the use of the welding process.

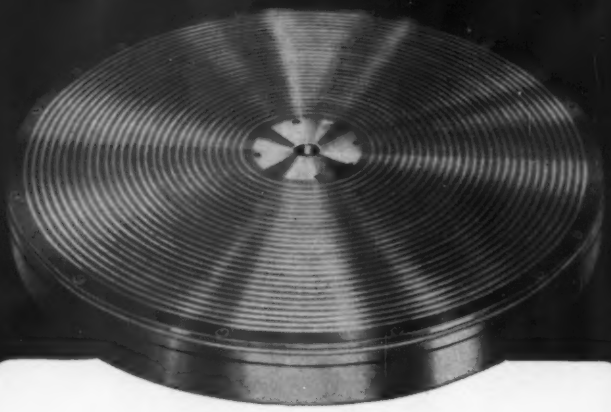
This is good reason that today more and more welders make use of radiography. If you would like to know how it can help your business, get in touch with your x-ray dealer and talk it over.

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

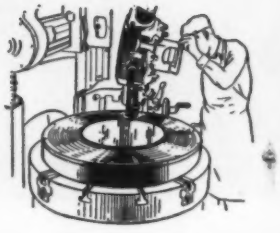
Radiography . . .
another important example of Photography at Work

Kodak

HARD-TO-HOLD PARTS
EASIER TO HOLD



Magna-Lock
electro-magnetic
ROTARY CHUCKS



On machines like vertical boring mills, rotary grinders and lathes, Magna-Lock Rotary Magnetic Chucks can solve tough holding problems.

Elimination of complicated fixtures substantially reduces set-up time, provides easier access to work piece.

Of rugged welded *all steel* construction, moisture-proof and shock-proof, Magna-Lock Rotarys range in size from 6¼" diameter face to 72" diameter. Sectional type for automatic loading — unloading can be furnished.

Hold your hard-to-hold parts with Magna-Lock — *first* to increase your machine's productivity.

Get details, DEPT. AM-15

Request Magna-Lock as original equipment on your new machines.

Hanchett MAGNA-LOCK CORPORATION
Magna-Lock
Magnetic Chucks and Devices
BIG RAPIDS, MICHIGAN, U.S.A.

bad parts. They were taking all the spoiled work home with them; at least we thought they were taking it all home. After they had been there several weeks we began to have trouble with stopped-up toilets. A little time and effort spent in making the company attitude toward spoilage known to them eliminated this difficulty but they still carried some of the spoiled work home with them; but we didn't mind at all.

William Martin
Brooklyn, NY

•

GOSSIPING WIVES

How much importance should a foreman attach to a supposed or legitimate gripe existing in the shop which he hears about indirectly? Should he approach the man in an attempt to clear it up?

IF NEWS REACHED AL'S ears, through the medium of his wife who had heard from a reliable source, that one of his men had a chip on his shoulder, I would think it was up to him to do a little investigating. And believe me, when I do any investigating I don't believe in beating around the bush.

Just because a man is a foreman does not mean that he has to take anything that comes along. If for nothing more than in defense of his wife's feelings I would say that it is up to him to dig out any dirt that happened to be thrown his way. I'd make it a point of getting to the source of the gripe before the little sore became malignant.

I don't think this is anything to be done on company time even though it is company business, except that I would go to—let's call him Grumpy for convenience—and I'd say: "Got a little matter I'd like to talk over with you and the wife; how about Mabel and me dropping over this evening?" It's only to be expected that Grumpy will spoil a job or two before the quitting bell because his conscience will throw a monkey wrench in his coordinating apparatus. This is what is known in steel treating as the soaking period, and he'll say to himself over and over again: "Now what has Tilly been opening her big mouth about!" You can bet your Aunt Emma's Sunday girdle that matters will come to a satisfactory solution or else Grumpy will show his true colors and pack up his tools.

This habit of carrying tales home is not to be recommended; it is beyond the pale of sound judgment. Any man guilty of such practice

POP'S school of filing

GULLIBLE GUS HEARD POP SAY NICHOLSON CURVED TOOTH FILES HAVE UH SMOOTH SHAVIN' ACTION
--AN' THAT THEIR TEETH IS "RAZOR SHARP"!
--SO HE'S TRYIN' ONE OUT ON THEM WIRE-BRUSH WHISKERS O' HIS. HAR!!
STAN RANDALL

Even so, Gus isn't far off the beam. Curved Tooth files in the Nicholson Superior brand have a shearing or "shaving" action that is marvelously fast and smooth cutting on sheet and annealed tool steels, cast iron, brass, bronze, aluminum, magnesium, plastics, etc.

Their high efficiency and savings in workmen's time are brought about by such minutely developed technical features as these:

Teeth have just the right face angle for good bite, and gullets are smoothly rounded to minimize clogging when used on soft or ductile materials.

Teeth of almost unbelievable sharpness are *milled* in (not chisel-cut) with specially designed machines.

Teeth have just the right radius and spacing to keep at least two teeth in "non-chatter" contact with the work along any one line.

Nicholson Superiors come in a full range of popular types and shapes: Rigid and Flexible; tanged and holed; Flat, Pillar, Square, Shell and Moulding—for wide and narrow surfaces, for concavities and for convexities. For a wide range of uses, *there's nothing like Curved Tooth files and no brand like Nicholson Superior.*

BUY FROM YOUR INDUSTRIAL DISTRIBUTOR

NICHOLSON U.S.A.

NICHOLSON FILE CO. • 29 ACORN STREET, PROVIDENCE 1, RHODE SLAND

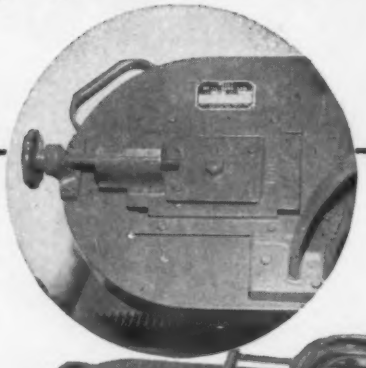
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ont.)

BLACK DIAMOND MADE IN U.S.A.

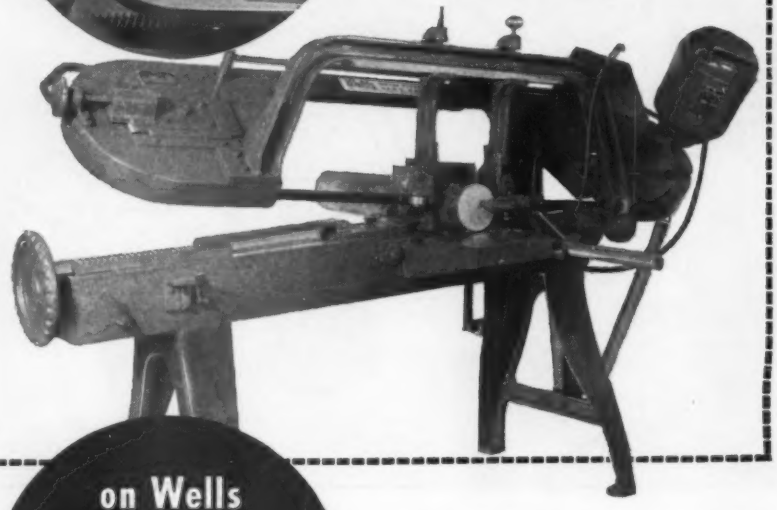
NICHOLSON... A FILE FOR EVERY PURPOSE

NOW

Wells offers you fool-proof blade tensioning . . .



At left is a close-up of the new Wells blade tensioning device—simple, yet positive and fool-proof. Below is a Model 800 with blade tensioning.



on Wells No. 5, No. 8, No. 12 and Model 800 cut-off saws

NOW IT IS POSSIBLE to maintain a constant blade tension on Wells cut-off saws. You can replace or change the blade any number of times, yet quickly and easily duplicate the correct blade tension. The new device is standard equipment on the models listed above. Simply turn the tension hand wheel until the fixed and moving indices coincide. At this point the blade tension is correct regardless of a variation in the length of the blade.

The incorporation of this blade tensioning device into Wells Saws eliminates the guesswork in blade tensioning. It means longer blade life and better cutting. Only Wells Manufacturing Corp. offers you this remarkable advancement in horizontal metal cutting band saws.

Ask your Wells Distributor to give you full information, or write for descriptive literature.

CAPACITIES OF WELLS SAWS AVAILABLE WITH BLADE TENSIONING

MODEL	CAPACITY	
	Rectangular	Rd. Dia.
No. 5	5" x 10"	5"
No. 8	8" x 16"	8"
No. 12	12" x 16"	12¾"
800*	8" x 16"	8"

*Designed for 1" wide blades and approved for use with new high speed steel blade.

Wells SAWS

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT RD., THREE RIVERS, MICHIGAN

hasn't advanced much, if any, beyond the stage of adolescence. Does it ever occur to these guilty jackasses that their wives have enough to contend with without cluttering up their already-frustrated minds with petty shop troubles?

Personal troubles, particularly imaginary ones, become enlarged by passing them on to others. The housewife usually has a limited horizon of activities and naturally likes to enlarge upon any chance which might enable her to exercise her claws. In the event that her husband has a complaint about the foreman and it seems to her that her "big man" is being unduly imposed upon, you can depend upon it that she is going to bat for his welfare by passing a word or two among the wives of the other shop members.

It may be that the husband is working along under a grave misapprehension, as is the case nine times out of ten, and what is usually a pet peeve is soon fanned by the winds of silly gossip into a serious grudge. Try it out sometime, Mr Annoyed Worker, and let it be known to your loyal wife that you are being unnecessarily picked on by your foreman and just graph the progress of the grudge from day to day. Boy, will you have your eyes opened! You'll see the smouldering embers break out into destructive flames in a very short while.

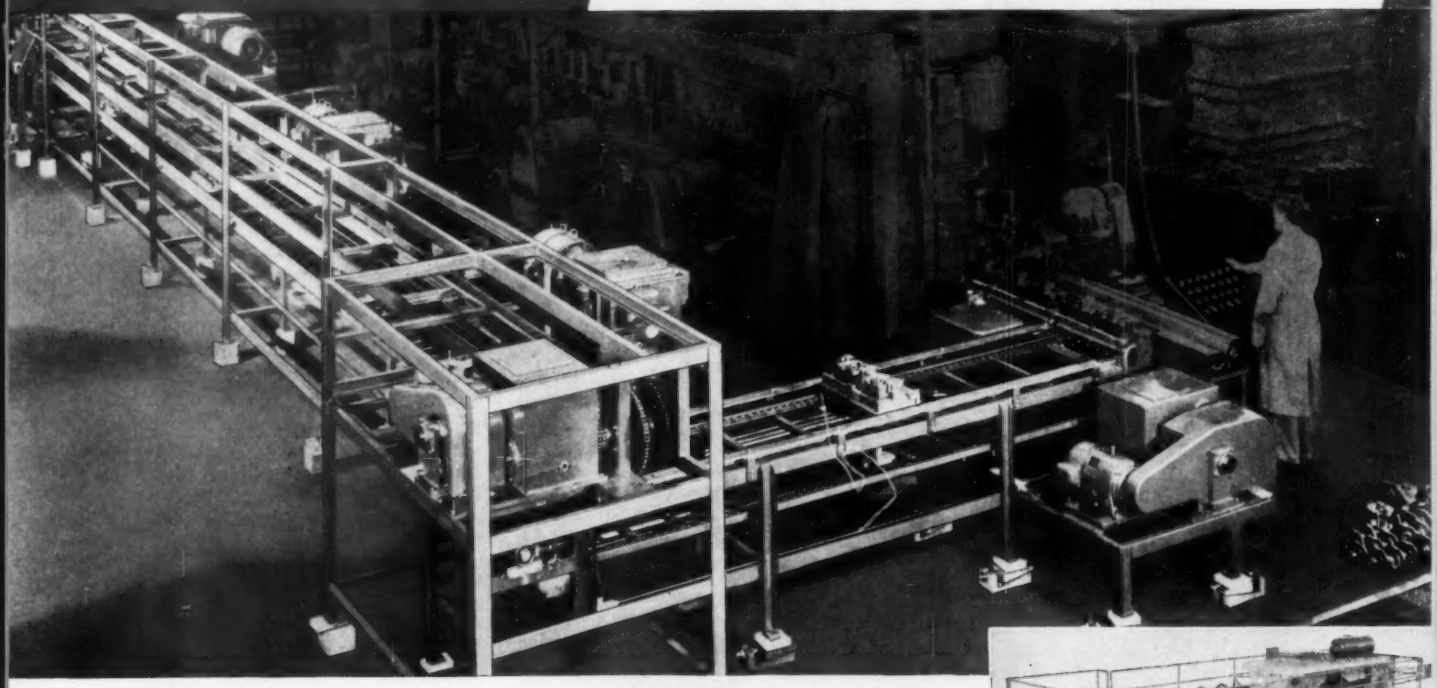
There may be times when you will be inclined to forget the insignificant incident, Grumpy, but not so the little woman—No siree! You've let her taste the wine of gossip. To the one who is "cooped up within these four walls, slaving over a hot stove all day long—day in and day out," she will see to it that she makes the most of a batting spree while she can.

In the event of a disagreement between the boss and the worker,

"I've been trying to watch your work, Bronson. Where do you do it . . . At home??"

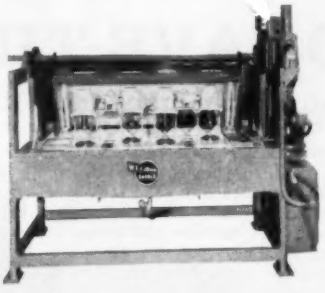
Now Available

A Special AUTOMATION EQUIPMENT Designing and Building Service



▲ Many progress-thru type machine tools employ special conveyors to return the work-holding fixtures to the loading end of the machine, as shown above. Barnes conveyors are designed to do this work automatically, in cycle with the machine, to greatly reduce work-handling costs.

▲ Another Barnes unit designed to speed work-handling is this special two-carriage automatic loader and unloader for handling heavy railroad axles before and after machining. Smooth, accurate traversing of the carriages is accomplished with a special electrical slow-down circuit.



▲ This special semi-automatic testing machine was developed by Barnes to test for leaks in automotive power steering castings. It handles four workpieces per cycle. Except for loading and unloading, all operations are performed automatically.

COMPLETE facilities are now provided by the Process Equipment Division of the W. F. & John Barnes Company for the designing and building of standard and special automation equipment. Widely experienced in this specialized field, Barnes have developed many units, both large and small, which are now successfully and profitably cutting work-handling costs and increasing production output in hundreds of industrial plants. The three units illustrated are typical of the broad range and variety of thousands of methods and processes developed by the Barnes' Process Equipment Division.

Here at Barnes, you'll find the varied engineering and creative skills, plus over 75 years of machine building background, to help you solve many troublesome production problems. And because all planning, engineering, and manufacturing efforts are closely coordinated, you have available a complete *Automation Equipment Service* from one convenient source.

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Find out how these unique creative and specialized resources can help you cut costs. Your problem will be given expert and individual attention.

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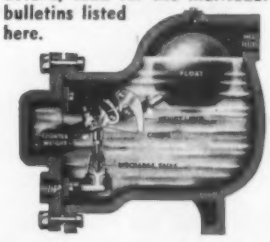
3 WAYS TO SAVE TIME

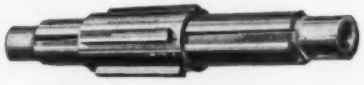
in Production and Maintenance

On the basis of their time-saving records, leading shops are increasingly standardizing on these 3 Nicholson units. For details, send for the individual bulletins listed here.



NICHOLSON AIR TRAPS—For intercoolers, aftercoolers receivers, tanks, etc. Feature non-plug and non-wire-drawing valve. Instantaneous operation and extra large drainage capacity effect fast, positive action. Catalog 953.

NICHOLSON CONTROL VALVES — Specially treated hard seats, wide choice of metals for specific mediums, and easy repacking cut maintenance time. Non-corrosive flat discs lap themselves on seats. Many leading plants have adopted Nicholson valves because of their longer leak-free service. 2-, 3-, 4-way and special types. All manner of operation. Size ¼" to 2½"; press. to 5000 lbs. Catalog 552.



NICHOLSON EXPANDING MANDRELS—Set of 14 does work of 209 solid arbors; sensational time savers in some operations. Sold singly or in sets; for bores ½" to 7". The standard in shops the nation over. Bulletin 653.

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TRAPS · VALVES · FLOATS

would it not be to the worker's advantage if he were to ignore it while it is still young and let it die? Sure it would; but no, the sap has to beat it home to his trailer and weep on his wife's shoulder and spill the works that he has been abused. Thus the long fuse is lit and soon the detonating spark reaches the keg of powder at the first meeting following, and then the ladies go into action.

Usually the foreman's wife, innocent of the whole affair, suffers mental anguish from the catty remark of Grumpy's side-kick and in turn looks to her husband for an explanation. Grumpy, the complaining wife's loud-mouthed husband, no doubt put a gash in the miller table or some such damage to a valuable piece of equipment and as a consequence the foreman gave him a hell of a bawling out, which the man couldn't take.

Yes, Al, you can afford to talk to the man with the gripe and it is your duty to do so and if necessary give him hell for being such a weakling. If necessary, if he can't take it, grease the skids and launch him down the chute without benefit of champagne.

Frank Van Horn
Auburn, Calif

•

CAN AL AFFORD TO TALK to the man with the gripe or must he wait until the man comes to him? If the unpleasantness is of long standing, Al cannot afford *not* to talk to the man. On the other hand, if it is a flurry of recent origin, perhaps it had better be left alone for a time; so many nuisances straighten themselves out if treated in that way. Few things play greater havoc with industrial amity than do tales from husband to wife of unjust treatment at the hands of foreman, manager, director or chairman. Dissatisfaction over executive treatment is not confined to any one grade; managers and directors all have their own pet resentments, for reasons sometimes real, sometimes imaginary.

The married man with a grouse against his foreman who has not the good sense or the courage to let that executive know of his dissatisfaction, should not saddle his wife with his troubles. To do so is no cure. In point of fact, it only aggravates the worry, since continued discussion between them of the subject merely serves to feed the flame, keeps the husband's mind in a ferment and totally unfits him for any form of cooperative shop effort. Much better to have the tooth out by free and frank discussion with the person

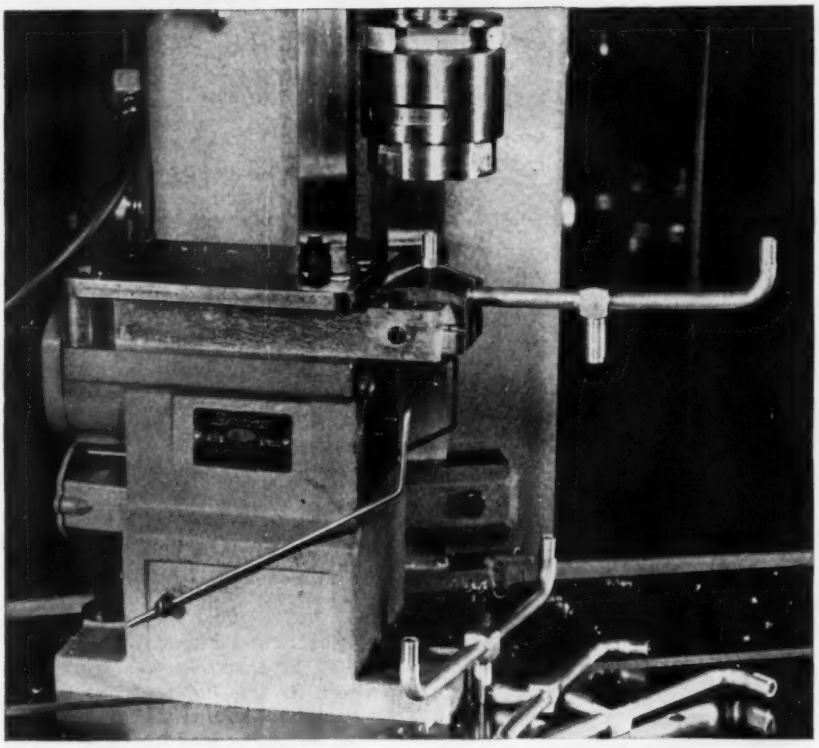
Quicker changeover, lower tooling costs...

with SNOW FULL UNIVERSAL MACHINES

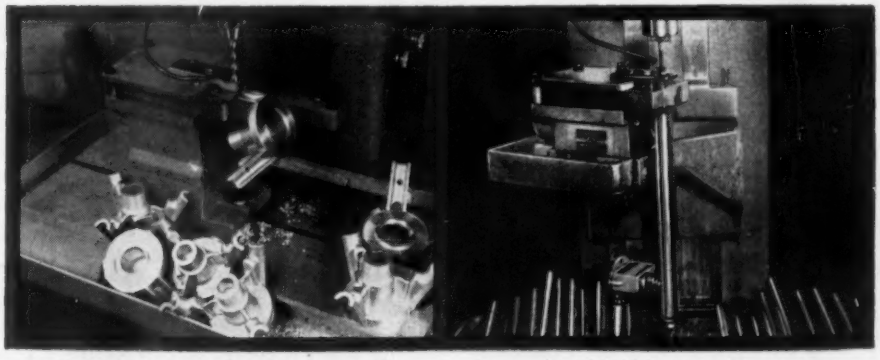
ELECTRICALLY OPERATED AIR CONTROLLED AUTOMATIC OR SEMI-AUTOMATIC

Basic Master Fixtures for DRILLING, THREADING or TAPPING. Snow universal machines are the most flexible, most efficient, and most economical known. They save countless dollars in changeover time — help you start jobs sooner — assure quality at high production rates.

The square footage under a Snow Machine in your factory can be the most profitable in your whole plant. Submit details of your requirements.



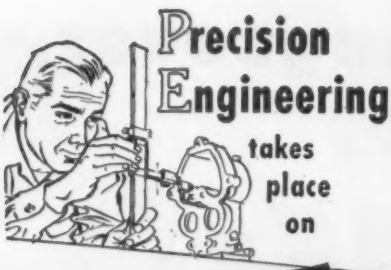
AIR VISE holds part firmly — self-centering — always in exact position for precision work. U-shaped wire underneath provides quick finger-tip control, automatically starting spindle cycle. Jaw inserts keep tooling costs at minimum. Blank jaws always in stock — can be tooled to fit your part promptly, inexpensively.



Irregularly shaped parts are easily handled. Front feed permits close setting of guide plate for greater accuracy with high production.

Here a short AIR VISE mounted on an offset table holds long tubing. Piece-part switch under table automatically closes vise and starts tapping operation.

SNOW MANUFACTURING CO., BELLWOOD, ILL.
(Suburb of Chicago)



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concerned. In this enlightened, democratic age when Jack's as good as his master, no man need continue nursing an unresolved grouse against his foreman.

The modern foreman, the efficient foreman, is only too well aware of the disruptive elements inherent in such a situation and, in the interests of shop atmosphere, he would be only too willing to examine a disgruntled employee's complaint. If the aggrieved one does not or will not see that and if the social atmosphere of the bridge club continues to be disturbed by domestic animosities, Al's course is clear. He must, in his wife's interest and in the interests of shop team spirit, approach the man and arrive at some agreed solution which will do justice to both. That should not be a difficult matter.

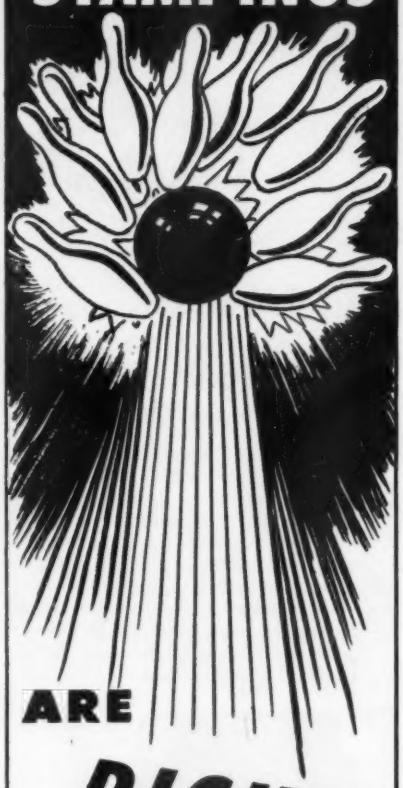
Either the man has a grievance or he hasn't,—it's just as simple as that. If Al approaches the man, and if the man is honest and frank about his gripe, Al, as the man in the dock, will be in a position to judge if he has been unjust or even inconsiderate. If he considers he has, he owes him an immediate apology and a promise which should be redeemed forthwith. If he honestly feels the man has no case and cannot convince him of that, he should have the matter investigated by neutral opinion. If the man will not agree to this procedure, arrangements for his transfer to another section might be put in hand and if refused, he should be asked to seek work elsewhere in the hope of finding job satisfaction under new management.

Al can best help his wife in her dilemma by critically examining his conscience and by trying to view the matter from the grouser's angle. If he finds that that refreshing exercise gives him pause, if it occasions even a slight twinge, he should take immediate, remedial action. The difficulty, as I see it, is that the precise nature of the trouble is not indicated and *that*, to my mind, is a sound reason why Al should approach the man with a view to clearing the air.

In addition, it might also be not a bad idea if Al took the matter up with Personnel, in an effort to have impressed on all concerned that social functions are decidedly out of bounds when it comes to complaints concerning works administration. Misusing social occasions in that way is not cricket and is a muddlesome abuse that should be firmly dealt with in the early stages before it becomes established custom.

Following that lead could, of

CUSTOM STAMPINGS



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Tool Steel Topics

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Want Fast Tool Steel Service?

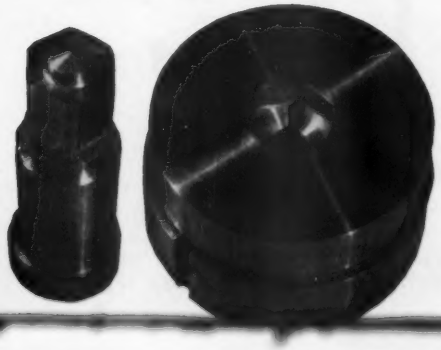
SEE YOUR BETHLEHEM DISTRIBUTOR

Whether you want to order a short bar of tool steel, or merely wish advice about some phase of heat-treating, you're sure to find your Bethlehem tool steel distributor anxious to be of service.

For prompt service is your distributor's middle name. Why else does he make it a point to know your city like a book — its background, its people, its industry? He knows what kinds of steels you are most likely to need, and in what quantities. And so he keeps large stocks of Bethlehem tool steel on hand, in a variety of sizes and quantities, ready to go at a moment's notice.

If you want bars cut to special length, or if there's some tricky phase of metallurgy or any other tool steel problem troubling you, again your distributor is at your beck and call. He's a real friend.

66 HS and XX Team Up in Difficult Nut-Forming Application



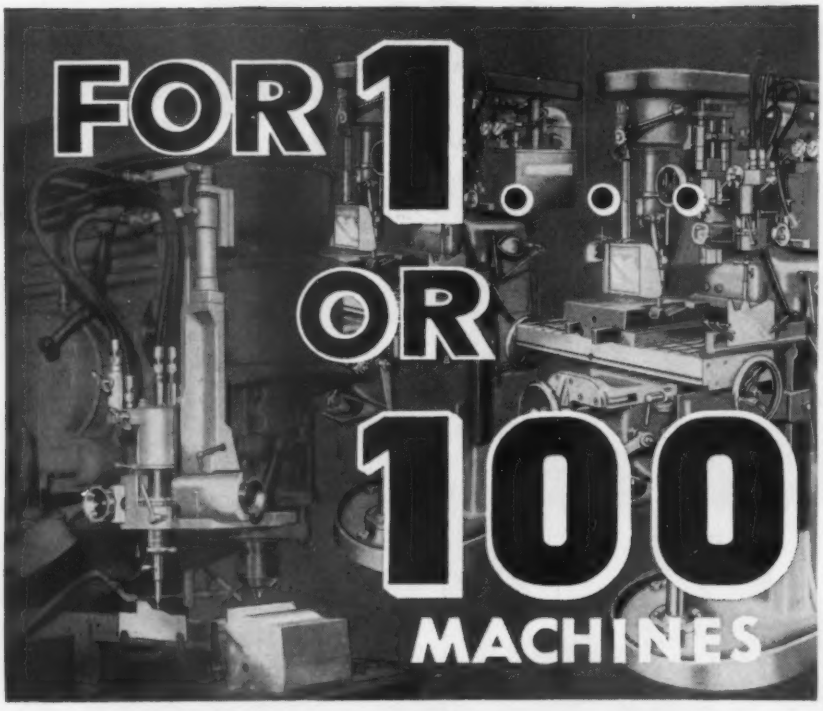
The hexagonal punch and doming die, each quenched and drawn to a Rockwell C hardness of 61-63, are used in a cold-forming operation by a maker of nuts. The punch is made of 66 High-Speed. It is doing an outstanding job in holding close tolerances because of its excellent resistance to wear. The XX Carbon Steel die also provides good wear resistance, as well as resistance to shock, its high surface hardness and tough core enabling it to withstand repeated blows of the punch.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

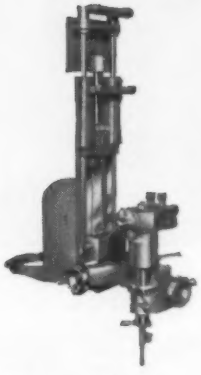
Scale is Tough Stuff

Whenever hot-rolled scaled stock is used in place of cold-rolled stock, the service life of the punches and dies drops to as much as a third of normal, largely because of the abrasion of the scaled hot-rolled surface on the cutting edges of the tools. The peculiarities of each situation determines whether or not such a substitution is economical.

So the question is often asked: What can be done from the tooling end to avoid decreased production? If punches and dies are normally made from water-hardening carbon tool steel, or from manganese oil-hardening steel, decreased tool life can be avoided by changing to a high-carbon, high-chromium steel, such as Lehigh H or S. Such a change would largely overcome the disadvantage of hot-rolled scaled stock. But if high-carbon, high-chromium steels are already being used, effecting an appreciable improvement can be accomplished only through special heat-treatment, such as short-cycle hardening, or nitriding.



GOODRICH HYDRAULIC



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Beat competition . . . modernize shop facilities with an inexpensive replacement program. Costly milling and hand finishing are eliminated.

This sturdy Hydraulic Duplicator adapts quickly to small or large operations . . . tolerances are held to precision limits for master pattern and template work without constant checking. The Duplicator shuts off when straight machine operation is desired.

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617 May Street Lansing, Michigan

course, lay Al open to the charge of attaching too much importance to a woman's lack of good taste but in view of the annoyance suffered by Al's wife, through no fault of her own, he is left with no choice. At the risk of conferring on the regrettable incident a spotlight it does not merit, Al must protect his wife's interests and, incidentally, help to keep the bridge party clean.

Some men may think, or pretend to think, that woman's views are not important, but most men of experience and most women too, know that they are vitally important and must be taken notice of. If the bad feeling between the griper's wife and Al's wife is allowed to continue, much avoidable harm can be done. Misery and dissatisfaction can then upset two households and bring to naught the very purpose which social clubs are formed to serve. Al and the man with a grievance must work amicably together if the interests of the company are not to suffer. The misery would also spread to the shops and neither Al nor his man would be comfortable in their dealings. And all because of what? Perhaps some trivial unpremeditated slight, some forgetfulness, or some thoughtless lapse on Al's part. It could be that a complete misunderstanding on the man's part is the cause of all the pother and a frank discussion between the two men might put everything to rights and relate an imaginary wrong to its true perspective.

•

In the circumstances, that could only be discovered if Al took the lead which, in the interests of all concerned, it is his bounden duty to do. Looked at in that light, the man's wife, for all her lack of good manners, despite her clumsy handling of a delicate situation, could be regarded as having rendered a service to her husband and to Al.

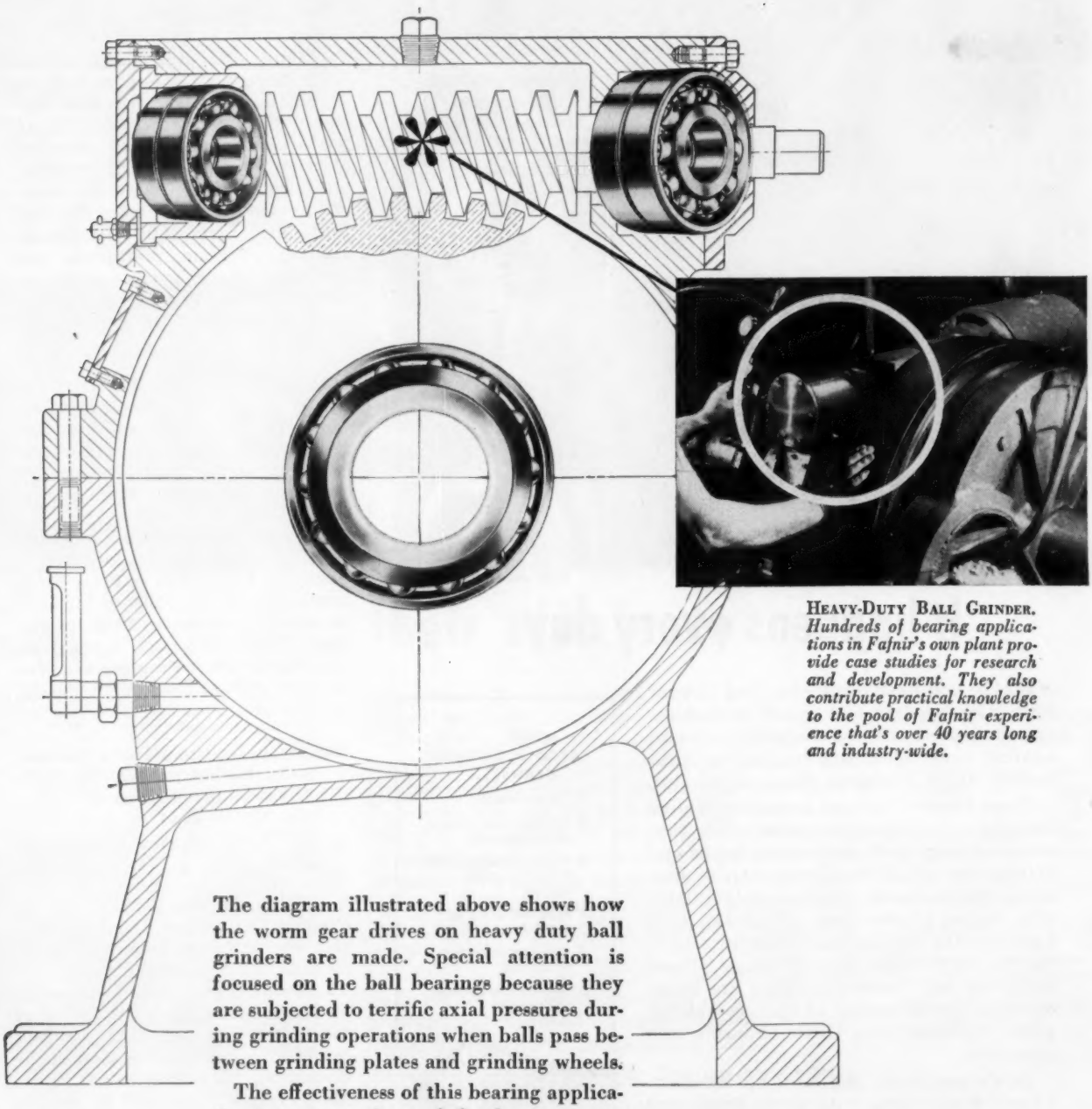
C Donald
Lanarkshire, Scotland

to withstand repeated blows of the punch.

cycle hardening, or nitriding.

More Turns For The Worm

on Fafnir Ball Bearings



HEAVY-DUTY BALL GRINDER. *Hundreds of bearing applications in Fafnir's own plant provide case studies for research and development. They also contribute practical knowledge to the pool of Fafnir experience that's over 40 years long and industry-wide.*

The diagram illustrated above shows how the worm gear drives on heavy duty ball grinders are made. Special attention is focused on the ball bearings because they are subjected to terrific axial pressures during grinding operations when balls pass between grinding plates and grinding wheels.

The effectiveness of this bearing application is a matter of record. On the worm gear shaft illustrated, the duplex pairs of bearings have been in operation for 16 years without replacement . . . protecting the worm gear by rigidly locating its shaft and affording adequate carrying capacity for the combined radial and heavy thrust loads.

If you have similar equipment, maybe we can help extend its service life. The Fafnir Bearing Company, New Britain, Conn.

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BALL BEARINGS

MOST COMPLETE LINE IN AMERICA

ACCO Registered* Slings

Photo courtesy Allis-Chalmers

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From him you can get a variety of sling chains to the length you need, with your choice of sling, grab, or foundry hooks and fittings that will fit the sling exactly to your work. For instance, you can get ACCOLOY sling chains in sizes from ¼" to 1¼" that have four-leg working load limits from 9,500 lbs. to 199,000 lbs. at a 60° angle. These limits are not theoretical. They are based on actual proof-testing of each completed ACCO *Registered* Sling Chain to insure safe operation.

Don't wait until you have an accident. Check today with your ACCO *Registered* Sling distributor or write our nearest district office for further information.

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1 The best material
2 Unit safety factor (on bodies, rings, links, hooks)
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4 Actual field service test of each design
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for Better Value

New Books

MATERIALS FOR PRODUCT DEVELOPMENT — 1954 — *Published by Clapp & Poliak, Inc, 341 Madison Ave, New York 17, NY. 160 pages, Price $7.50.*

Containing the proceedings of the Basic Materials Conference held in Chicago in May, 1954, this book discusses many of the problems facing product designers in their selection of materials. The six basic problems under consideration were: Materials of the future, new metal-forming processes, nonmetallic materials, joining, corrosion protection, and materials management. Also included are the 258 questions and answers presented at the meetings.

•

PMI TECHNICAL PAPERS. *Transcript of fifth annual spring technical meeting. Published by the Pressed Metal Institute, 2860 East 130th St, Cleveland 20, Ohio. 138 pages. Price $5.*

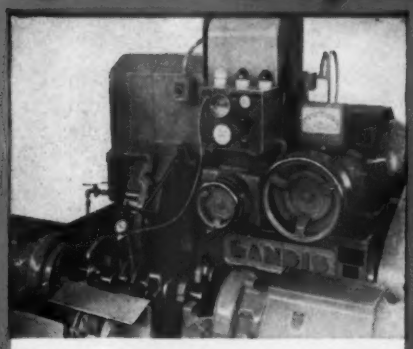
Five papers were given at the Spring technical meeting: Safety in a Stamping Plant; Power Press Problems—Safety; In Process Material Handling; Resistance Welding—Design, Application and Production; and Plastic Dies—Progress and Possibilities of their Use in the Industry.

•

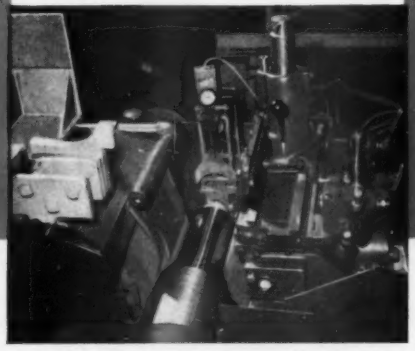
INDUSTRIAL DESIGN (SECOND EDITION) —*By Harold van Doren. Published by the McGraw-Hill Book Co, 330 W 42nd St, New York 36. 379 pages, 6½ x 10 in. Price, $6.50.*

Subtitled "A Practical Guide to Product Design and Development," this very thorough book lives up to its title (and subtitle) with ease. The treatment of subject matter is is always from a practical point of view, keeping the limitations and needs of end result prominent in the discussion. The author has spent many years in the field of design, and shows, with his knowledge, the wide experience needed by the successful designer in both manufacturing methods and customer preference.

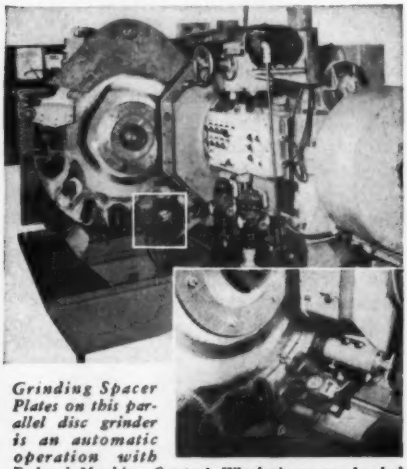
Subjects covered range from techniques and materials used in making a clay model or mockup, to kinds of machines which will form sheet metal. Other chapters include research methods for consumer attitudes, merchandising requirements,



Grinding Main Journals on a Crankshaft is done quickly and without scrap with this Federal Air-Electric Grinding Gage. The operator loads the machine, snaps the caliper on the work and starts the machine cycle. When the work is down to size, the wheel automatically backs up. The large Air Dial and the three signal lights provide visual checks on the progress of the grinding. With this Machine Control Gage it is impossible to grind undersize scrap because the gage automatically backs the wheel up when work is to size.



This Federal unit, employing an Arnold continuous caliper type grinding gage, automatically controls the size of the journal surfaces of 1100 lb. freight car axles. The gage, ordinarily retracted to provide loading clearance, automatically springs onto the work and takes control of the grinding process at the start of the grinding cycle. Signal lights tell the operator when work is "over size", "near size", or "to size" and are connected electronically to the machine controls so the grinding cycle is automatically stopped when the required size is obtained. Tolerances are consistently maintained well within the plus 0.0005", minus 0.0000" specified.



Grinding Spacer Plates on this parallel disc grinder is an automatic operation with Federal Machine Control. Workpieces are loaded in the slotted carrier wheel and the gage controls the feed of the wheels to compensate for wheel wear. Corrections are made alternately to each wheel-head to maintain the centering of the carrier wheel. Automatic controls assure continuous production of good pieces, eliminating scrap.

A few of many applications

Federal Machine Controls make the grinding of automotive rear axles practically automatic.

FEDERAL *Automatic* MACHINE CONTROL GAGES

have established their efficiency

AUTOMATION is a new term applied to an idea that general machinery manufacturers have been doing ever since Eli Whitney invented his Cotton Gin. But, controlling Machine Tools automatically so that they produce work to required sizes is comparatively new.

Federal, however, has been designing and building Gages for this purpose for several years. We offer this tried and proven experience to all builders and users of machinery where Automatic Dimensional Control of Machine Tools is desired. We can handle all phases of the work; from work-handling through gaging, machine control and disposal.

Federal is ready to provide standardized package units for air, electrical, electronic or combination controls and **will cooperate with your engineers to adapt these to your machine requirements.** Call —

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SOME OF MANY POSSIBILITIES

Percentage reject control. A simulation of automatic statistical Q.C.

Automatic shut-off when dimension out-of-control.

Automatic tool adjustment or compensation.

Tool Adjustment Signalling.

Automatic classification according to dimension.

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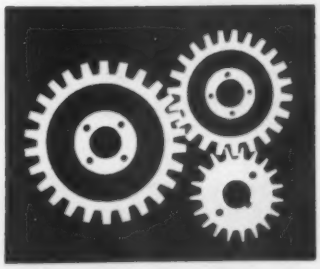
Perkins is a *gear engineering* organization with a 35 years' tradition of New England craftsmanship as background. As one of the country's largest producers of gears to customers specifications, Perkins will meet your specific requirements for gears—regardless of size, type, material or quantity desired, *and at competitive prices.* You furnish the specifications, we'll produce the gears.

PERKINS MAKES in all materials, metallic or non-metallic, and in any size, to your specifications: helical gears, bevel gears, sprockets, ratchets, worm gears, spur gears with shaved or ground teeth, ground thread worms.

NOTE: The **PERKINS PRECISION SPRING COILER** is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want *when* you want it — in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire Sizes .005 to .125. Diameter from 3/32" to 12" and larger. Size of the compact coiler is only 7½ x 16". **A POWER MODEL** mounted on a welded steel console cabinet base is also available. Full information on request.



Perkins Machine & Gear Company

WEST SPRINGFIELD, MASS.

and use and mis-use of color, with postscripts on the fee question and the potential future of industrial design.

The only shortcoming notable in this book is the lack of color plates of any kind, and an unfortunately "muddy" quality in reproduction of some of the illustrative material .

•

ORDNANCE. GOVERNMENT-OWNED PATENTS AVAILABLE FOR LICENSE. PATENT ABSTRACT SERIES NO. 6— *Published by US Dep't of Commerce. 58 pages, 8x10¼, Paper cover. Price $2. Available from Office of Technical Services, US Dep't of Commerce (Room 6227) Washington 25, DC. Order No. PB 111469.*

Similar to Abstract No. 4, this book contains abstracts of 644 patents relating to all types of ordnance equipment available to manufacturers on a royalty-free basis. Items covered include artillery, small arms, ordnance machinery and processes, measuring and testing equipment, ammunition, and other ordnance items.

•

METAL PRODUCTS FROM HOLLAND — *Published by The Association of Metalworking Industries, 13 Nassaulaan, The Hague, Holland. 756 pages, 6×8 in.*

Available without charge to companies interested in importing metal products, this book is a detailed catalog of the products of the many members of the association. Printed in both Dutch and English, it contains an alphabetical list of manufacturers, list of representatives in all countries, an index of products, and a complete listing of products.

With characteristic thoroughness, even the advertisements are printed in both languages, and it will be an eye-opener to many to realize the broad scope of Metalworking in the Netherlands.

•

TESTING OF STAINLESS STEEL WELDMENTS — *By Helmut Theilsch. Published by the Welding Research Council, 29 West 39th St, New York 18, NY. Paper cover. 26 pages, 8¼ × 11¼. Price $1.*

The information contained in this bulletin consists of both published and unpublished material dealing with the major testing and inspection procedures for stainless steel weldments. It includes visual, magnetic-particle, fluorescent-penetrant, dye-penetrant, radiographic, ultra-

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for Greater Strength
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Steel-Weld Fabricated parts and assemblies can save you time and money in many ways . . . they eliminate pattern costs and give you greater strength with less weight. The parts and assemblies shown at the left, and the forty-ton frame and carriage shown above—parts of a loading device for a large extrusion press—are typical examples of thousands of Steel-Weld Fabricated units produced and machined by Mahon for manufacturers of processing machinery, machine tools, and other types of heavy mechanical equipment. If you need a special mechanical device, or if you require parts or assemblies involving large heavy pieces where time and pattern costs are a consideration, you can call on Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to handle the entire job from drawing board to finished machining and assembly. You will find in the Mahon organization a unique source . . . a source where design skill and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Sweet's Product Design File for information, or have a Mahon engineer call at your convenience.

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different DRILL or TAP operations on one press

The Howe & Fant Turret Drilling Machine.

Pre-set depths, pre-set speeds and reversals, all attention-free during successive operating cycles.

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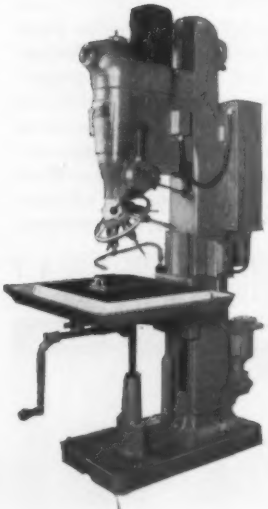
- **Capacity**—½ inch. Floor space required—34 x 50 inches.



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Your name _____
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sonic, mechanical, and corrosion testing. Also included are removal of trepanned plugs and saw-cut specimens, leak testing by hydrostatic methods, air pressure, chemical indicators, and mass spectrometers, etch testing, and restrained crack-sensitivity testing. A bibliography is included.

•

PACKAGING MACHINERY DIRECTORY—*Published by the Packaging Machinery Manufacturers Institute, 342 Madison Ave, New York 17. Price $10.00.*

Loose-leaf, leather-covered, this directory is designed so new information issued by the Institute can be added. Three sections cover trade names and owners of the names, types of equipment, and an alphabetical listing of members.

•

APPROACHES—*fifth of a series of booklets on creative thinking. Published by the Creative Thinking Institute, 738 Sheridan Rd, Chicago 13. 12 pages, 8½ × 11 in.*

More or less a "house organ" for the Creative Thinking Institute, this short pamphlet tells several ways to apply knowledge to a problem. In other words, most people have the ability to solve very difficult problems, but a lack of understanding of how to approach a new situation with an open mind keeps most people from doing "problem-solving" most efficiently.

Judging only from this pamphlet, it is hard to tell if there is much news in the authors' approach. Probably so, but anyone interested would have to have much more information than is available in the booklet at hand.

•

FLUID FRICTION COEFFICIENTS—*By J R Fenniecome. Published by Emmott & Co, Ltd, 31 King St West, Manchester, England. 125 pages, 5×7½ in. Price 10 Shillings (about $1.40).*

Actually, the true title of the book is "The Friction Coefficient for Circular Pipes at Turbulent Flow." It is a highly technical study of fluid-flow characteristics, and includes some history of the science, considerable mathematics of a fairly high order, and graphic matter. Tabular and graphic data is presented as results of tests made by a number of men in the field.

MAXITORQ
Overload Release
CLUTCH

minimizes machine Down-Time

AT THE
GILLETTE SAFETY RAZOR CO.

The Maxitorq automatic Overload Release Clutch was designed especially to protect high-speed machinery, and we are gratified to have testimonials such as the following:

"The Gillette Safety Razor Company chose the Maxitorq Overload Release Clutch to protect a section of their blade and shaving cream packaging machines against costly down-time due to unpredictable machine jams.

"Over a period of a year, wrapping millions of blades per week, Maxitorq Clutches have eliminated machine down-time except in a few minor instances. Thus, more constant production has been maintained in the packaging department."

When an accidental overload occurs, the clutch automatically releases, stopping the machine, preventing damage to machine and product. When the jammed condition has been cleared, the clutch is re-engaged and the machine is again in operation. By means of a simple finger-tip adjustment, the clutch is set to transmit the normal running load.

There are six sizes, ¼ to 5 h.p. @ 100 r.p.m.; max. working torque ft. lbs. 13 to 263. Maxitorq "floating" discs prevent heating in neutral, and all assembly, take-apart, and adjustments are manual; disengagement is instant and complete. Submit your clutch problems to our engineers for practical solutions.

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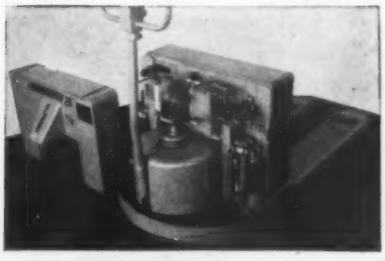
Make sure your maintenance man sees this!

Clark's POWRWORKER "26"*

The most "Serviceable" truck ever built!

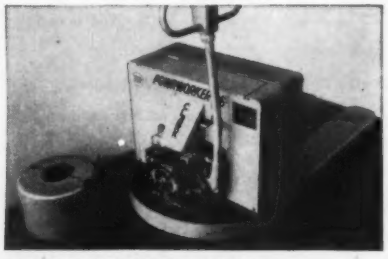
POWRWORKER "26" Pallet Truck
4000 and 6000 lbs. capacity
Also available as platform or tilting fork stacker

Ask him to compare these ACCESSIBILITY features!



HYDRAULIC SYSTEM EXPOSED IN 2 MINUTES . . .

Remove 4 bolts and slip off the one-piece cover; the complete hydraulic sub-assembly is exposed. Hydraulic motor, pump, oil reservoir, valve assembly and self-aligning cylinders are immediately accessible and ample space is provided for quick inspection or removal.



POWER HEAD READY-TO-WORK-ON IN 2 MINUTES . . .

Split cover allows complete accessibility to the drive motor, brakes, resistor and control panel by merely removing 7 screws. Revolving head permits servicing any side of the power head without further dis-assembly. For major overhaul, the whole unit can be removed in 17 minutes.

CHANGE DRIVE TIRE IN 12 MINUTES . . .

Standard Press-on type demountable tire is furnished as original equipment. Raise the truck 12 inches and loosen spanner nut which releases the axle shaft and the wheel drops out. Split wheel rim with spreader inserts allow immediate tire dis-assembly and re-assembly.

***The POWRWORKER "26" is only 26 inches longer than the load . . . the shortest standard truck on the market!**

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Industrial Truck Division
CLARK EQUIPMENT COMPANY
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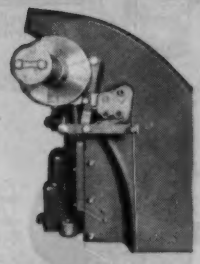
only FEDERAL has

so many big features!

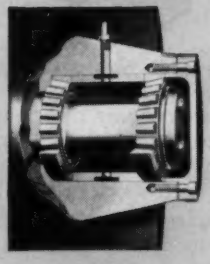
• **Patented Brake Design.** Spring tension permits expansion — available with automatic release, if desired.

No. 7 Flywheel type
Capacity, 80 tons

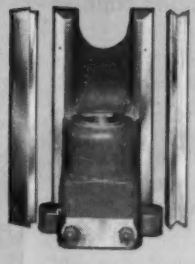
• **Solid Web-Type Flywheels.** An important safety factor.



• **Non-Repeat Clutch.** An exclusive Federal feature.



• **Timken Bearing Flywheels.** Eliminate wear on crankshaft, readily adjusted.



• **Longer "V" Ways, Gibs.** Added speed, accuracy. Hand-scraped to perfect alignment.

plus **Oversized Crankshafts • Generous Shut Height • Front-Operated Recline**

Here are important features, typical of the extra quality built into every FEDERAL Press. And they add up to give FEDERAL users a definite edge, production-wise and cost-wise. For these rugged, precision-built presses boost output, eliminate accidents, maintain high production schedules. Offered in four major classes—Standard, Dial Feed, High Speed and Special presses from 6 to 80 tons. Call your Federal representative. *Write for new catalog.*

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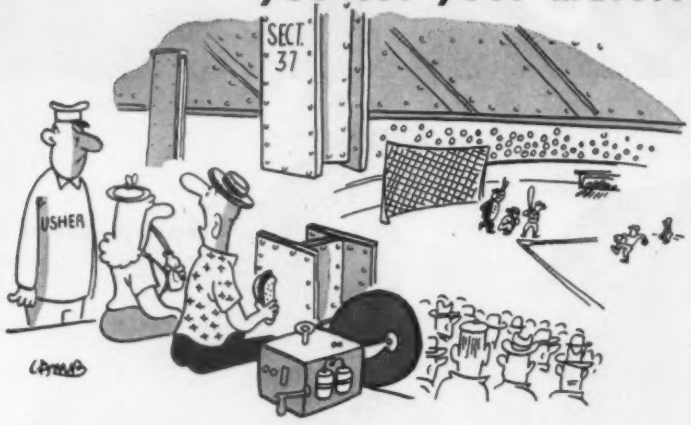
30 Years of Quality Construction

cut your costs . . . where you cut your materials



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Is your view of cost-economy obstructed by old-fashioned material cutting methods? If so, let us show you how dramatically some people have changed the picture by the use of abrasive cutting with specialized Allison Wheels.

Allison abrasive cutting wheels contribute to faster, better, cheaper production by greatly speeding the cutting operation and reducing time and labor costs.

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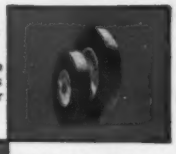

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the *best* way to cut many materials . . .

the *only* way to cut some.

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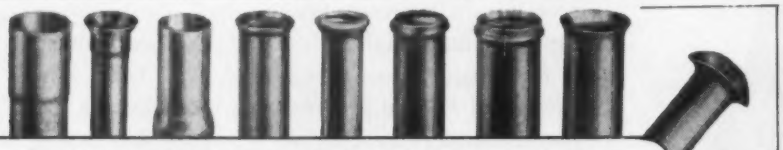

TUBE END FORMING MACHINERY for

Beading—Flaring—Flanging—Expanding—Reducing —Sinking—Swaging—Grooving—Double Lap Flaring and Flanging ⅛" to 4½" TUBING

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A Minster Press means

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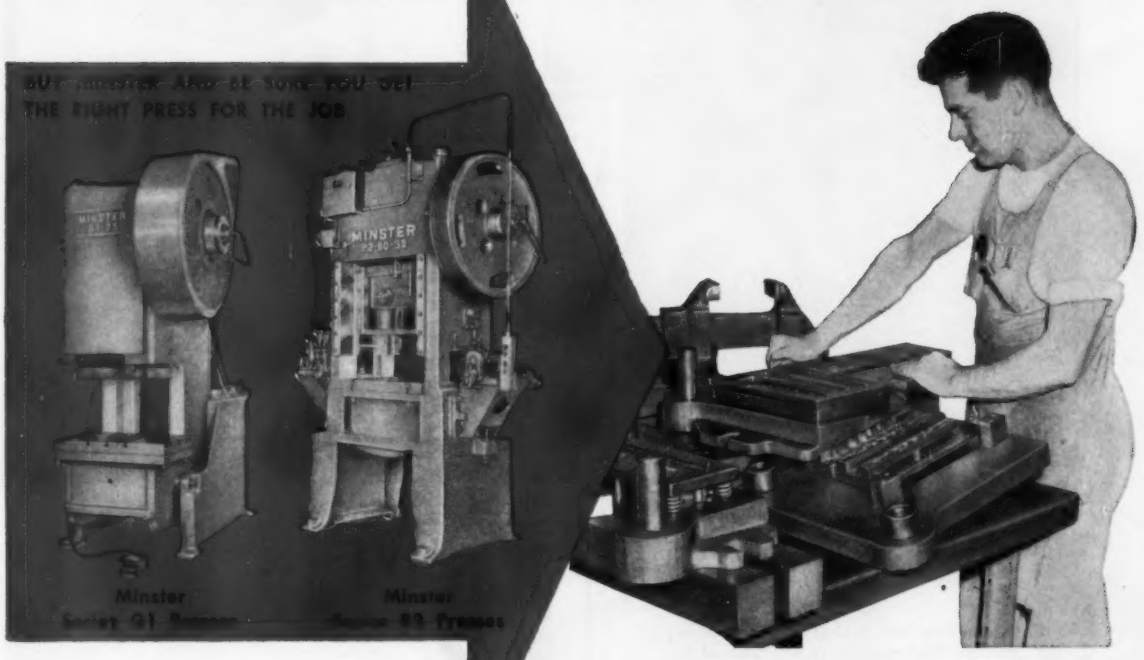

These Minster Press features *protect* dies from needless expensive repairs.

1. Rugged Minster Frames assure the greatest rigidity with the least possible deflection.

2. Accurate alignment of slide face and bed is assured by Minster Design. Beds scraped to surface plate. Long slide ways scraped square to slide face. Gibs accurately ground and adjusted for proper clearance using ground spacers on all front gibs of presses over 60 tons.

3. Minster bearing bushings honed to proper clearance thus reducing impact shock and snap-thru backlash.

4. Minster patented Combination Air Friction Clutch and Brake has smooth shock absorbing action which tends to reduce die wear caused by impact. Fast controlled engagement or disengagement on 360° surfaces gives opportunity for operator to stop slower presses before dies close in case of misfeed. It also makes possible the use of precision switches in dies to anticipate misfeeds on automatic operations and stop press before serious damage occurs.

Build a sound replacement program modernize with Minster Presses

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MINSTER®

PRESSES

Figure your Stamping Savings like this with—

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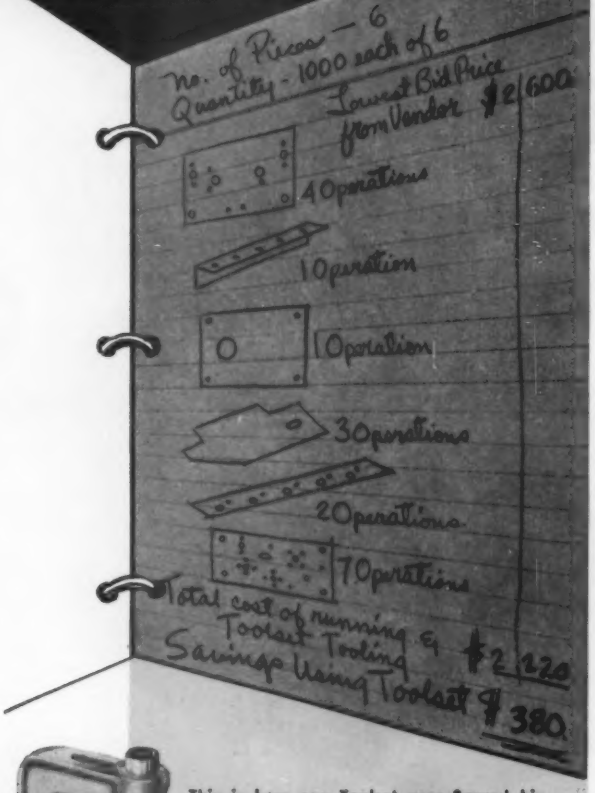
Adjustable Tooling



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Toolset Hole Punching and Notching Units give you closer hole centers, faster set-up, longer spring life, complete interchangeability. Available in widths from ¾" to 3½", throat depths from 4" to 16". Standard punches available in round, square, rectangular, up to 2⅛" dia. Special and larger shapes available.

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Start cutting costs NOW — Send coupon for Catalog of complete Toolset Line.

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Gentlemen:
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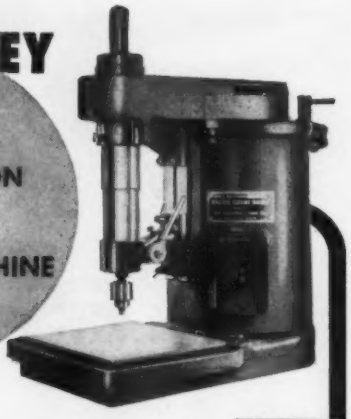
SIGOURNEY

M-100

the **PRECISION BENCH DRILLING MACHINE**



No ordinary bench drilling machine, but an extremely accurate, high speed, sensitive machine for precision drilling. Drills from ¼" down to extremely small sizes. Successfully used down as far as .008".

Table and column exactly squared, one to the other, and built with strength and rigidity for maintained accuracy. Hardened and ground spindles insure long life. Sealed ball bearings throughout for smooth operation from 4,000 r.p.m. to 10,000 r.p.m. Motor, driving belt, and spindles entirely enclosed for safety. Available with 1, 2, 3 and 4 spindles.

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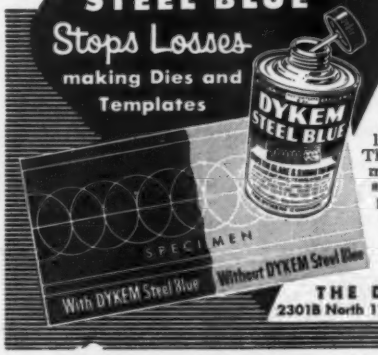
Stops Losses making Dies and Templates



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

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KNURLED HEADS PROVIDE GOOD GRIP
UNIVERSAL DRILL BUSHINGS
industry's standard of quality and service
100% CONCENTRICITY AND HARDNESS TESTS INSURE ACCURACY
BLENDED RADIUS HELPS PREVENT TOOL HANG-UP
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Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Vastly increased production facilities assure immediate deliveries. Write to the office nearest you, Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.

Universal products include: Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, and Universal Index Plungers. Write for catalog.

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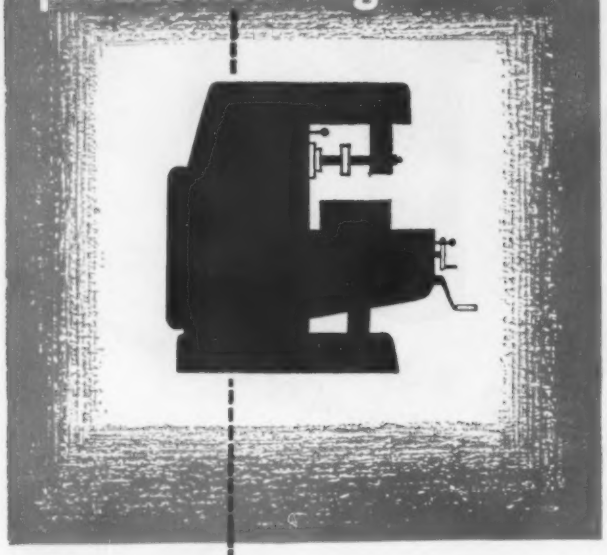

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Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

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Cutting-off should be done on a Hack Saw

Any way you figure it—speed, accuracy, squareness or cost—a hack saw will far out-perform a band saw when it comes to cutting-off from bars or billets. As builders of both band saws and hack saws we frankly admit this.

Basically, metal-sawing performance reduces to (1) the cutting-edge, (2) blade speed and (3) feed pressure, just as accuracy and squareness depend on the rigidity and tautness of the blade. In each of these basic factors the hack saw has a wide advantage—advantages which in actual results do average shop jobs as much as 4 times faster and for as little as 1/9th the blade cost.

Write for Catalog showing a complete, modern line of high-performance Metal Saws (Both "Band" and "Hack")

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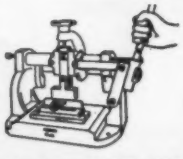
MARK ROUNDS or FLATS
WITH THE MODEL 9A MARKING MACHINE. COMES IN HAND, MOTOR AND AIR DRIVEN MODELS.



If you make precision parts you need the 9A machine.

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15 man-hours saved for every 400 lbs. of lubricant you use!

Alemite cuts costs!

all the way from barrel to bearing ...in maintenance...repairs... down-time...

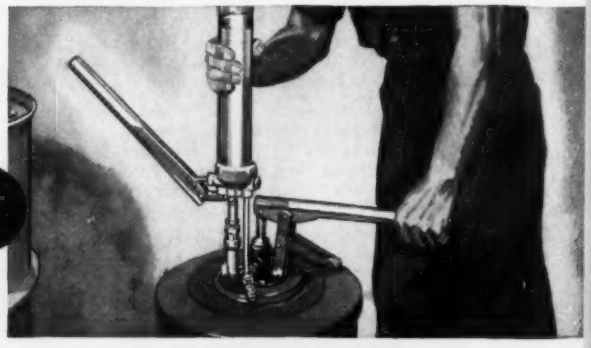
YOU SAVE...STEP BY STEP!

You start with a saving of 15 hours for every 400 pound drum of lubricant used. But that is only the beginning. Far more important is the saving in machine down-time, lubricant and costly bearing replacement. Because this combination of plant proved Alemite equipment insures better lubricated bearings—bearings lubricated only with "refinery fresh," protected lubricant!

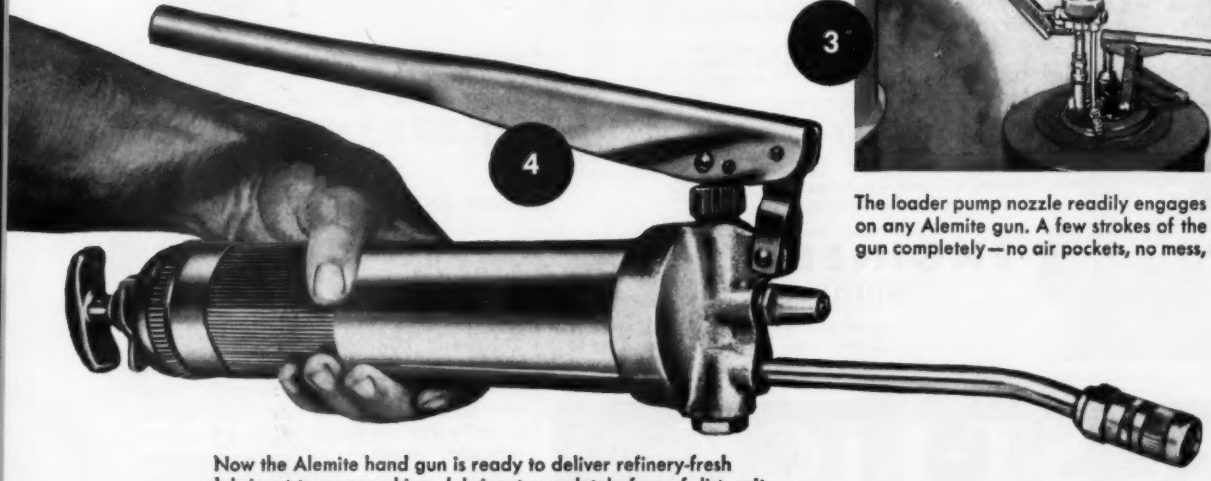
There is an Alemite Hand Gun with the capacity you need—from 8 ounces to 2 pounds. With the pressure you need—up to 15,000 pounds! And there is an Alemite Loader Pump designed to fit any standard size container that you normally use. Stationary models for 100 and 400 pound drums. Portable models for 25 and 35 lb. pails.

A drum of general-purpose lubricant arrives in the oil room. Clean, sealed, fresh from the refinery.

As soon as the drum is opened, an Alemite Loader Pump for hand guns is inserted, completely reseals the drum, protects against contamination.



The loader pump nozzle readily engages the loader fitting on any Alemite gun. A few strokes of the pump fills the gun completely—no air pockets, no mess, no waste!



Now the Alemite hand gun is ready to deliver refinery-fresh lubricant to any machine—lubricant completely free of dirt, grit, or abrasives—protected from barrel to bearing!

With Alemite Plan "A"
Only Refinery Clean Lubricant Reaches Machines

This combination of Loader Pumps and Alemite Hand Guns is known as Alemite Plan "A." It is one of five Alemite plans that your nearest Alemite supplier can show you. Ask him for your copy of the new Alemite booklet, "5 Plans for Better Lubrication." It will help you make lubrication plans that save money in your plant!

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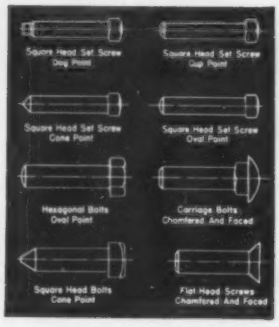
ECONOMY Automatic Pointing Machines

Save Time and Money!

TYPE 3300


Square Head Set Screw Dog Point
Square Head Set Screw Cup Point
Square Head Set Screw Cone Point
Square Head Set Screw Oval Point
Hexagonal Bolts Oval Point
Carriage Bolts Chamfered And Faced
Square Head Bolts Cone Point
Flat Head Screws Chamfered And Faced

Typical parts machined on the TYPE 3300

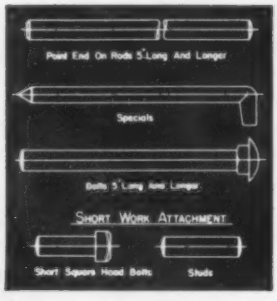
ECONOMY Automatic Pointing Machines are hopper fed and automatic in operation. These features enable operator to run several machines resulting in greater productivity and lower costs.

These Automatic Pointers are available in two sizes—Type 3300 for uniformly pointing bolts and screws to 3/8" diameter and 3/4" to 3-1/2" in length, the type 4600 for pointing bolts and cap screws 1/4" to 3/4" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

Production rates of the type 3300 vary infinitely from 2,000 to 6,000 finished parts per hour and on the type 4600 from 1800 to 5400 per hour.

Also available is the type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods 1/4" to 1-1/2" diameter, 5" or more in length. Production rates up to 2,000 pieces per hour make it a valuable secondary machine for short runs.

Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.



Typical operations performed on TYPE "P" Semi-Automatic Pointing Machines

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Automatic Pointing & Shaving Machines
Automatic Pointing Machines
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Automatic Pointing & Threading Machines
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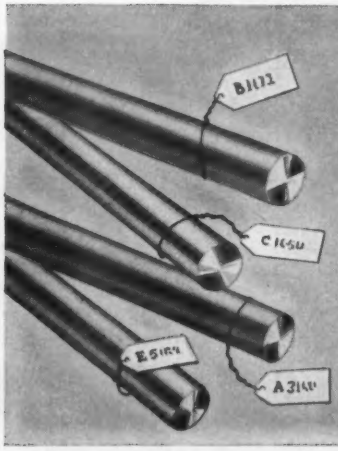

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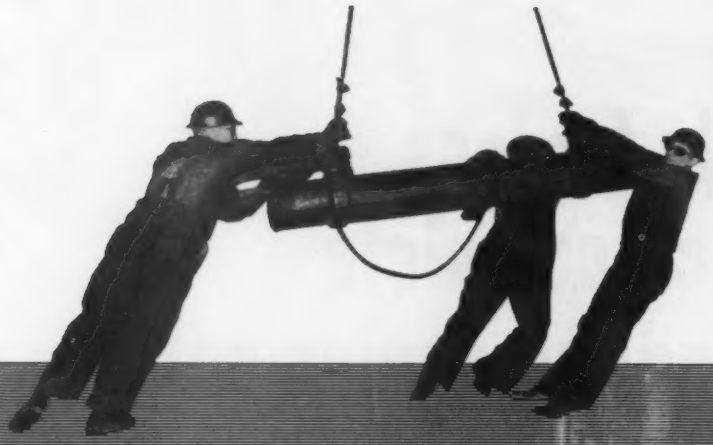

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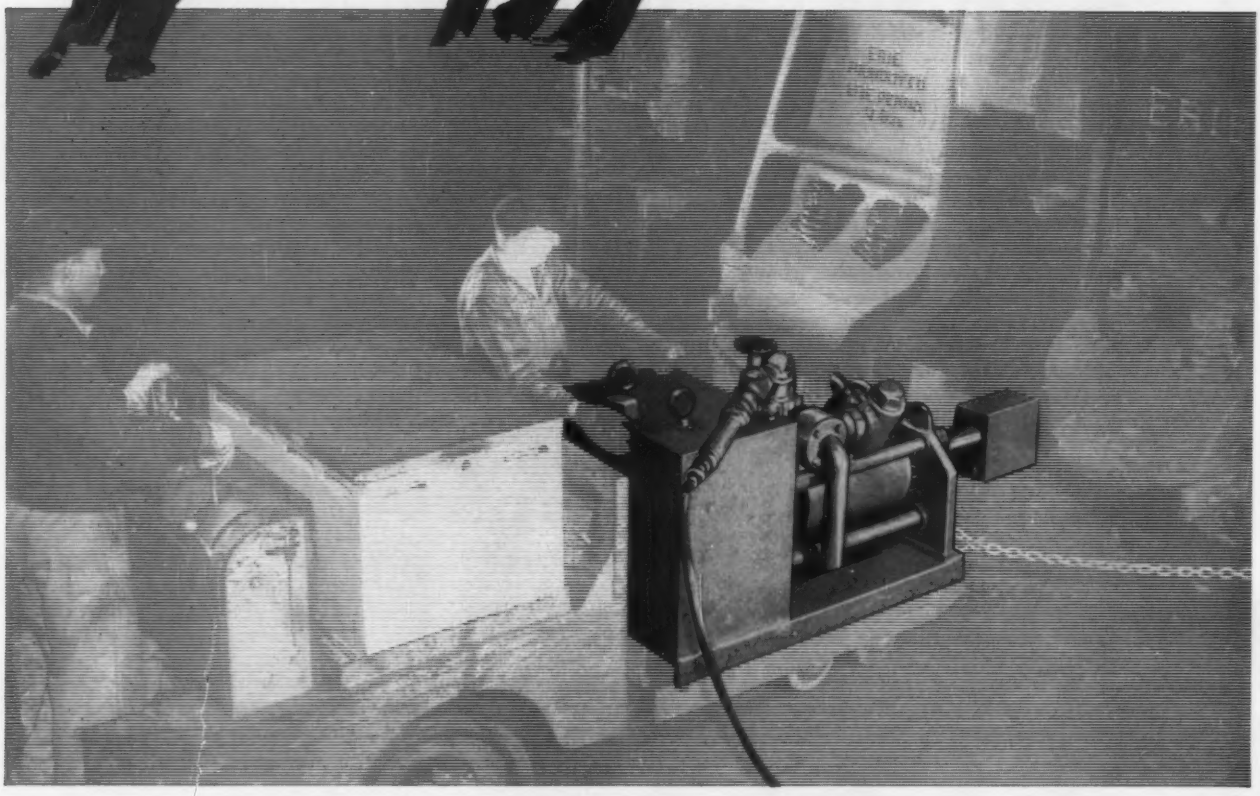

THE NEW ERIE KEY DRIVER

lets you drive keys safely . . . . . in one man-hour

STOP DRIVING A SPIKE WITH A TACK HAMMER!

Now, when driving die and sow block keys in forge hammers, the new Erie Key Driver will do with *two* men in *15* minutes what used to take *5* men (don't forget the crane operator) several hours! Let Erie Foundry Co. show you how to save maintenance man-hours, eliminate wasteful down time, reduce accidents.

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There's no danger of ram end-swing, no glancing blows, minimum mushrooming of keys. Every Erie Key Driver blow is true. One user says,* "The incidence of personal injury and property damage has been reduced to a relatively negligible nature by using the very efficient Erie Key Driver."

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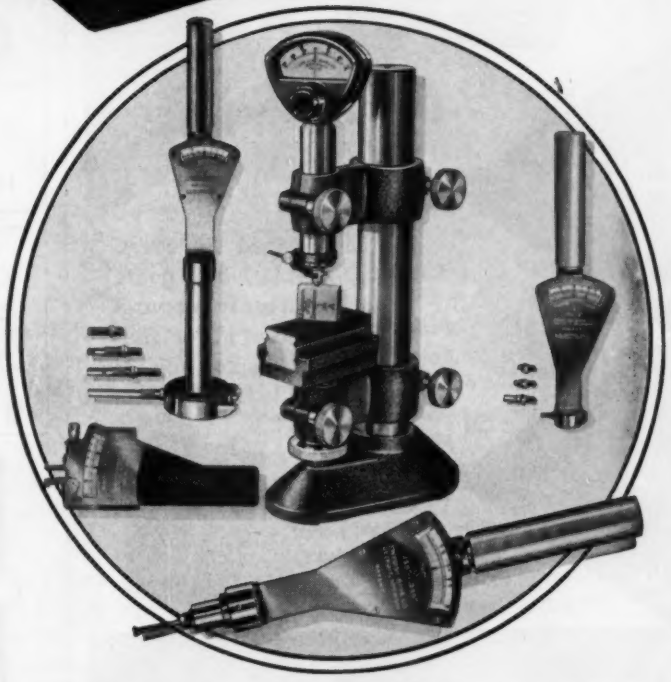

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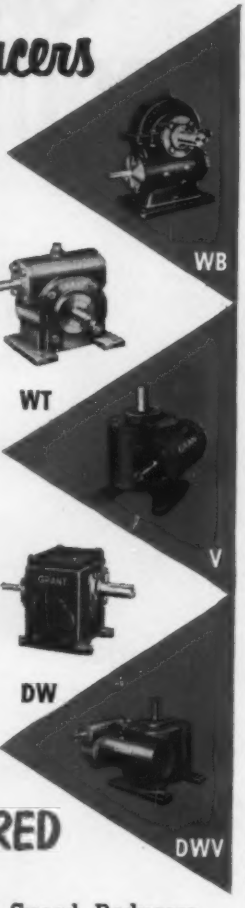
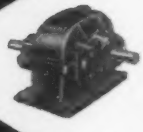
Grant Speed Reducers pay off!

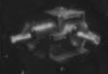


Whatever your speed reducer requirements, GRANT can supply any one of eight different types, each manufactured in a complete range of sizes.

Or if your need be something special, GRANT will make a Speed Reducer to your specifications.

PAY-OFF ASSURED





GRANT Speed Reducers, with precision-cut gears and accurately ground shafts encased in cast iron housings, assure you of long, trouble-free service.

Write for GRANT's new catalog for information on their complete line of gears and reducers.

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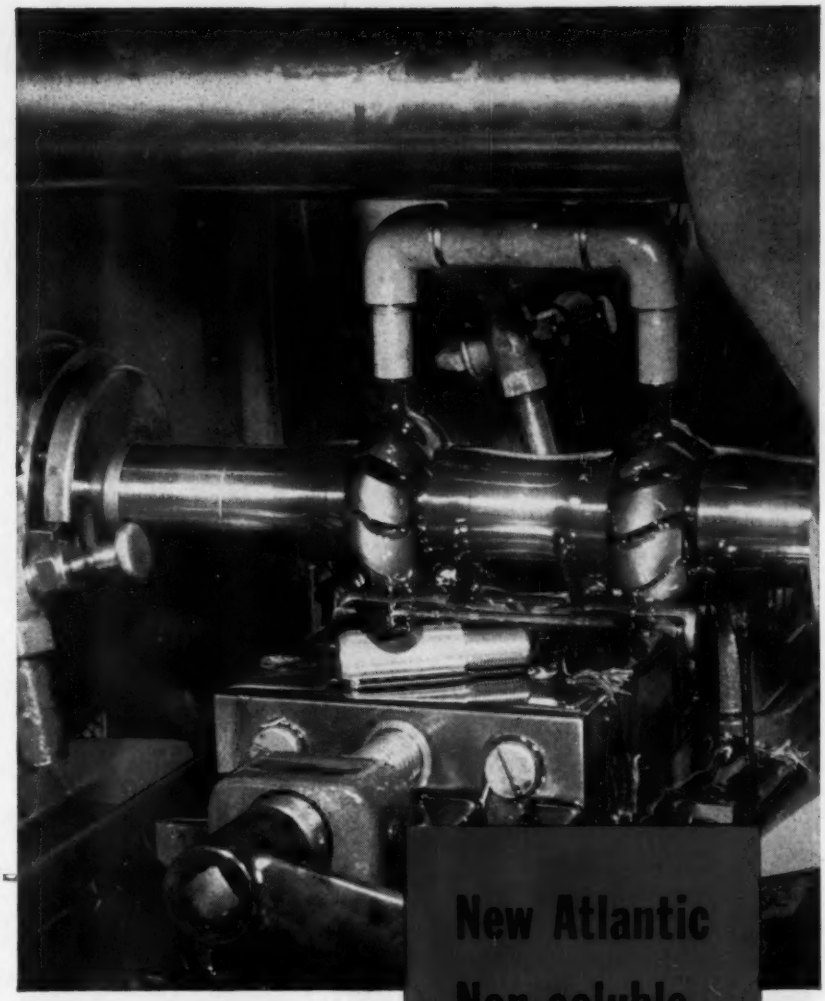

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The toughest job in the shop is the real test for cutting oils. And we want you to know how good these Atlantic Cutting Oils are.

So try them on your tough jobs: deep hole drilling, threading, difficult milling. You'll notice results that you perhaps never had before: Long tool life, superior finish, cool work, freedom from foul odors, ability to see the work right through the oil. These oils are compatible when blended even down to the heaviest grades.

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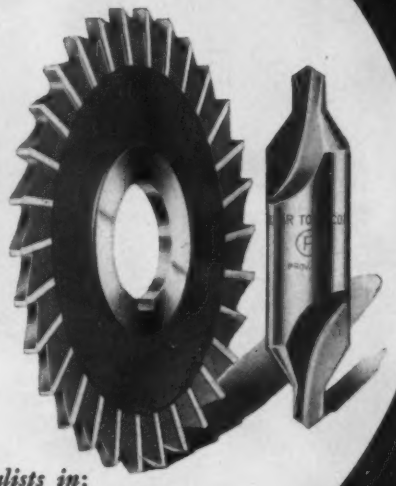

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Clad materials are not difficult to work, require only care and routine experience. "How to Work Clad Materials," an *American Machinist* Special Editorial Report, contains all the latest facts on how to work clad materials most efficiently and profitably. This 16-page report, complete with informative drawings, diagrams, and photographs, is still available for only 25¢ a copy. Write to Reader Service Department:

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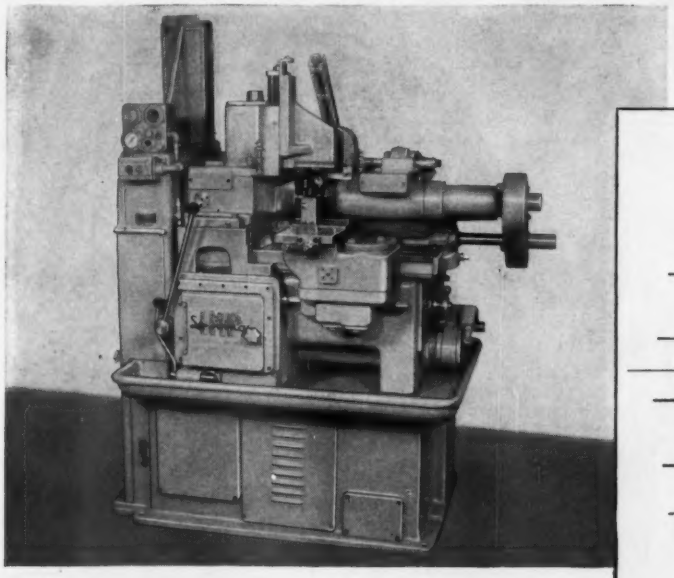
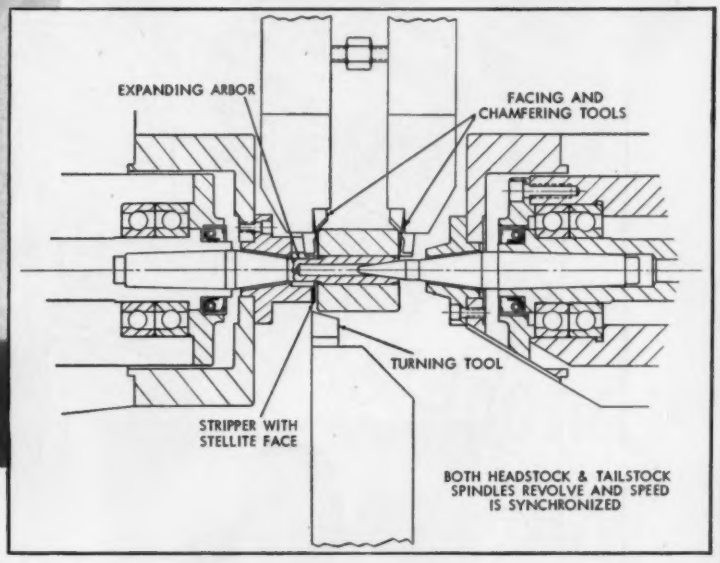
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK



Automatically-loaded Lo-swing IMP Lathe equipped for machining Oil Pump Gears


EXPANDING ARBOR
FACING AND CHAMFERING TOOLS
TURNING TOOL
STRIPPER WITH STELLITE FACE
BOTH HEADSTOCK & TAILSTOCK SPINDLES REVOLVE AND SPEED IS SYNCHRONIZED

AUTOMATICALLY LOADED Lo-swing IMP LATHE SPEEDS PRODUCTION OF OIL PUMP GEARS

PROBLEM: To automatically load, turn, face and chamfer pump gears made from powdered iron.

SOLUTION: The Lo-swing IMP Automatic Lathes selected for this job were equipped with a Rotary Type Loader which assures a constant flow of pump gears through the machine on a complete automatic cycle.

The parts arrive at the machine with the bore finished to size and with a small amount of surplus material to be removed from the faces and outside diameter.

The Lathes are equipped with revolving head and tailstock spindles, both of which are driven from a splined jackshaft. The advantage of the double end drive is two-fold. Since the piece is driven from both ends, coarser feeds may be used, and the double-end drive assures synchronization of the speed of both spindles eliminating slippage wear on the collet expander. Details of the tooling used are shown in the line drawing.

The pump gears are loaded into the chute, visible in the illustration, and are fed by gravity to the openings in the Rotary Loader which indexes the parts to the proper position. They are then picked up automatically by the revolving spindles which are withdrawn during the indexing of the Rotary Loader.

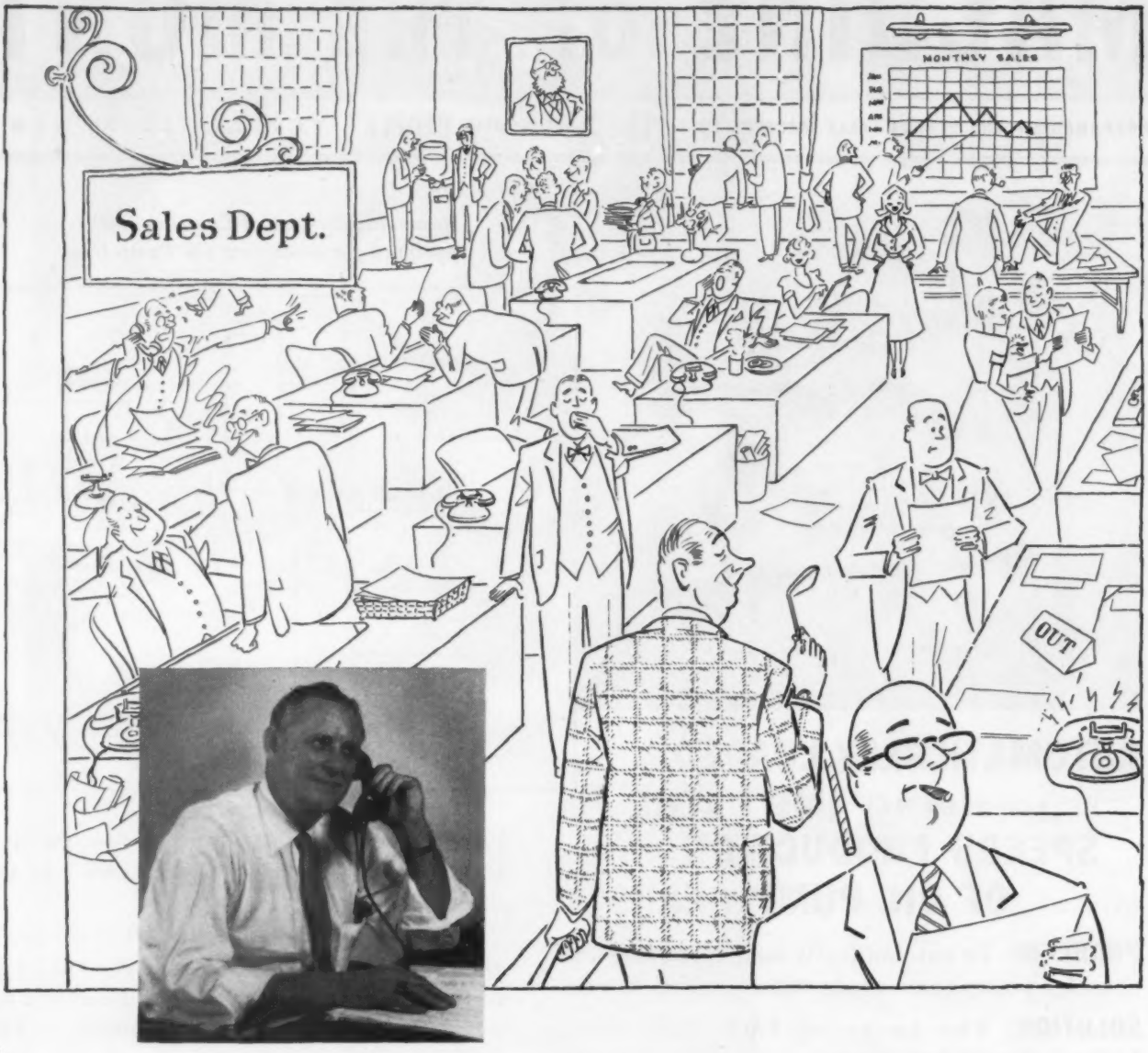
The outside diameter is turned with a carbide tool mounted on the front turning slide, while the faces of the pump gears are faced and chamfered with carbide tools mounted on the vertical slide shown in the illustration.

The Rotary Type Loader assures complete control over the fast revolving pump gears, eliminating danger to personnel and damage to parts since they are completely stationary by the time they reach the discharge chute.

Engineered jobs are our specialty. Our staff is at your disposal to assist in solving your problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing



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YOU don't have to "go down the line" . . . and back over it again and again . . . when you do business with Bristol. You deal with one man all the way . . . one man who has both the mill experience and sales know-how to speed your order straight through. You won't get the "I don't know but I'll ask someone who does and have him call you back" treatment. Whoever talks to you at Bristol has the full authority and responsibility to get your Brass to you quickest way. Nor does he have to be a vice president!

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So all you have to do when you call Bristol (Connecticut) Ludlow 3-9246 is simply to say: "I want to place an order". And the next voice you hear will be that of the man who'll take it from there to your receiving department.

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"How do you know it can't be forged?"

"Bristol-Fashion" means **Brass at its Best**

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Establishing a new world standard of angular measurement.

Companion set to the now famous "Laboratory Master" Linear Gage Block Set.

Technical Information

Material	Steel
Area of gaging surface	1" x 2"
Deviation from marked angle	±.25 Sec.
Calibration by Optical means	±.1 Sec.
Accuracy of furnished calibration	±.2 Sec.
FLATNESS	
Across width	.000002"
Along length	.000002"
Parallelism of sides	.000010"
SQUARENESS	
Gaging Surface to sides	2. Sec.
Surface Finish	.5 rms
Optional—Chrome Carbide optical flat reflecting target	
Size . . . . ¼" Thickness . . . 1¼" Diameter	

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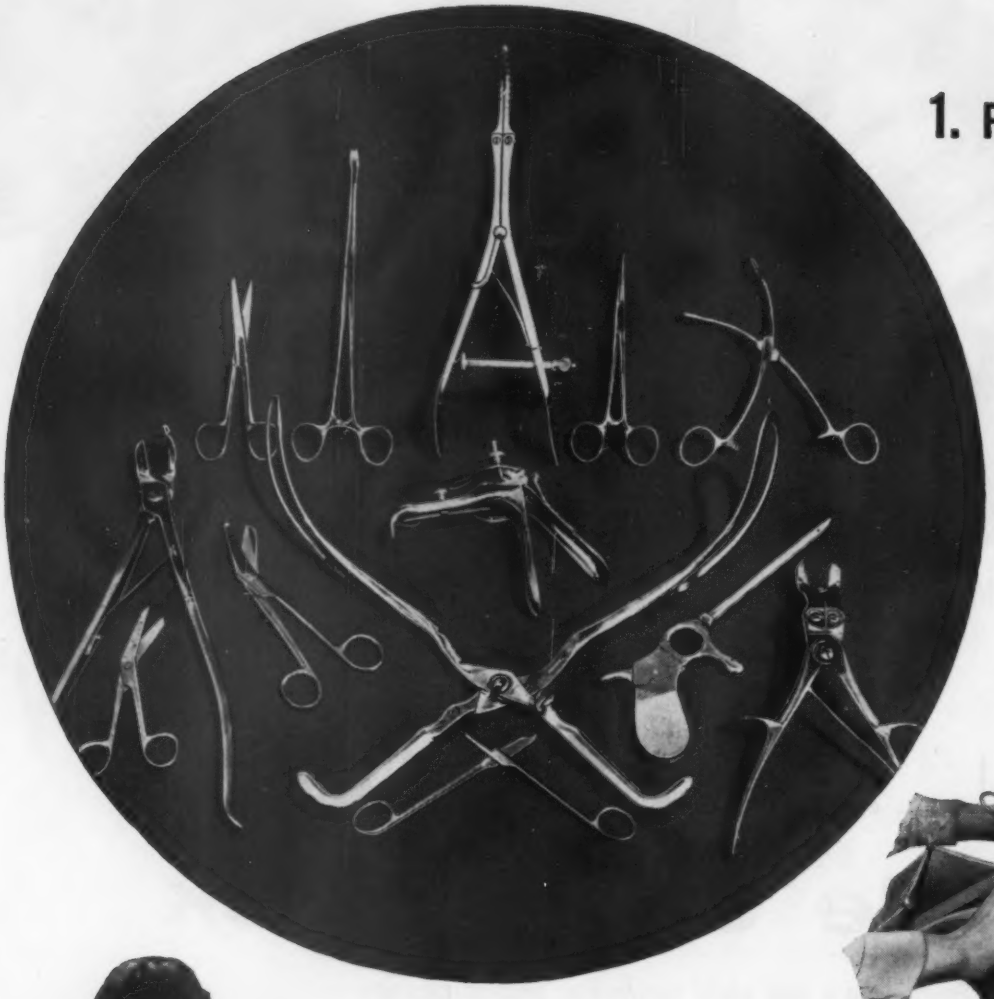

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To produce a more uniform finish on the multiple contours of stainless steel surgical instruments and cut unit costs of finishing and polishing. Witte & Schmitz Surgical Instrument Co. was using set-up wheels which left unsatisfactory finishes, tired operators.

2. SOLUTION:

A 3M Representative suggested that this Bridgeport, Conn. manufacturer switch to the 3M Backstand Method using Three-M-ite "Resinite" and Three-M-ite Cloth Belts. A 3M Methods Engineer helped the firm make up their own spindles and mounted wall idlers to make best use of limited space.

3. RESULTS:

An immediate 25% production increase with a far superior finish on the instruments. Too, the manufacturer found that unskilled workers could be trained to polish the multiple contours more rapidly, and there was less operator fatigue. 3M Representatives can help solve *your* grinding problems, too. Send coupon for facts.

WANT MORE INFORMATION?

Minnesota Mining & Mfg. Co.
Dept. AM-15, St. Paul 6, Minn.

☐ Send me free booklet: "Case History Reports on 3M Abrasive Belts."
☐ Have 3M Representative call.

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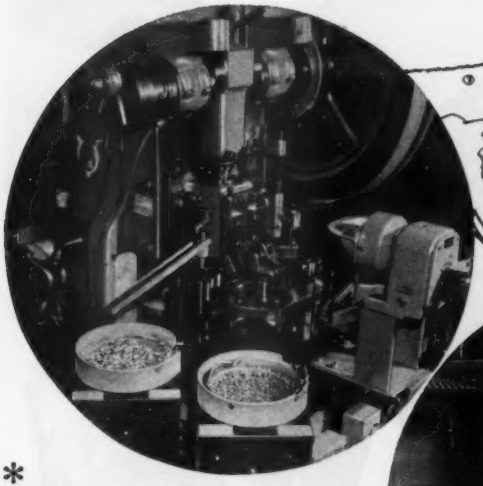
3M® ABRASIVES

Made in U.S.A. by Minnesota Mining & Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: London, Ont., Can., Export: 122 E. 42nd St., New York City. Makers of "Scotch" ® Pressure-sensitive Tapes, "Scotch" ® Sound Recording Tape, "3M" ® Adhesives, "Underseal" ® Rubberized Coating, "Scotchlite" ® Reflective Sheeting, "Safety-Walk" ® Non-slip Surfacing.

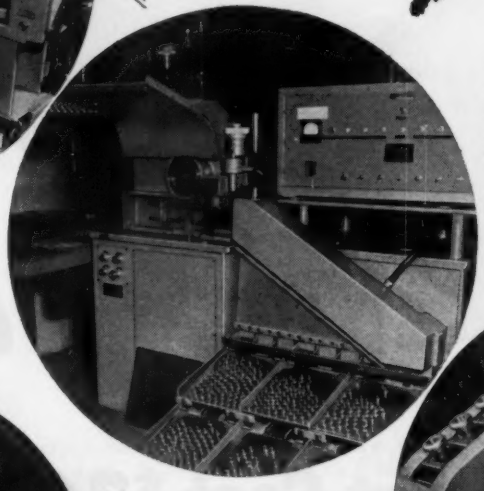
Blueprints call for bearings?

Call on NEW DEPARTURE

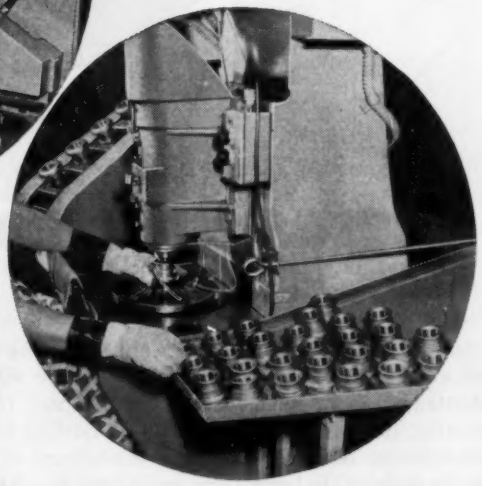
PDQ*!



* **PRICE!**—Savings of automation in New Departure plants are reflected in prices impossible with less modern methods. Here a unique machine automatically assembles refrigerator door bearings . . . with notable savings for the buyer.



* **DELIVERY!**—Electronics work at New Departure! Bearing races are speedily sorted into six dimensional classifications by this machine. Volume is up because New Departure invested in this modern equipment.



* **QUALITY!**—Painstaking quality control, at every manufacturing step, works to approach perfection in every bearing. Here you see an electronic inspection of operational noise level. Any sub-standard part is automatically rejected. There's no chance for error. You are sure of top quality—every time!

PLUS ENGINEERING SERVICE—There's no substitute for experience . . . and New Departure offers you an unmatched backlog of accumulated ball bearing knowledge. So whenever the prints call for ball bearings, check with New Departure for engineering assistance in bearing selection and application. Phone, wire or write . . . you'll get action from New Departure—PDQ!

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BALL BEARINGS

NOTHING ROLLS LIKE A BALL.

We've been saying

"Eye Accidents Cost More than

$5.00 Per Worker"

Here's One that Cost $2400*!

Claimant testified that while at work something blew into his eyes; that a fellow worker wiped the eye with a dirty shirttail; that he suffered considerable pain for several months; that several doctors could do nothing to alleviate his suffering. All of the physicians testified and all varied as to the cause of the injury. One theory was that the claimant was a malingerer; another that the claimant had inflicted the injuries himself; another that acid had come into accidental contact with the eye.

After hearing all the testimony, the court decided that the claimant had become blind in one eye as the result of an accidental industrial injury and awarded $24.00 per week compensation for 100 weeks.

98% of industrial eye accidents can be prevented with an adequate Eye Protection Program. It saves eyes. It saves time. It saves litigation. It saves money — in compensation, insurance, idle machines, first aid and in the quality of production turned out. Ask an AO† Safety Representative for details. Or write American Optical Company, 1311 Vision Park, Southbridge, Mass., for booklet.

*In compensation alone

American Optical
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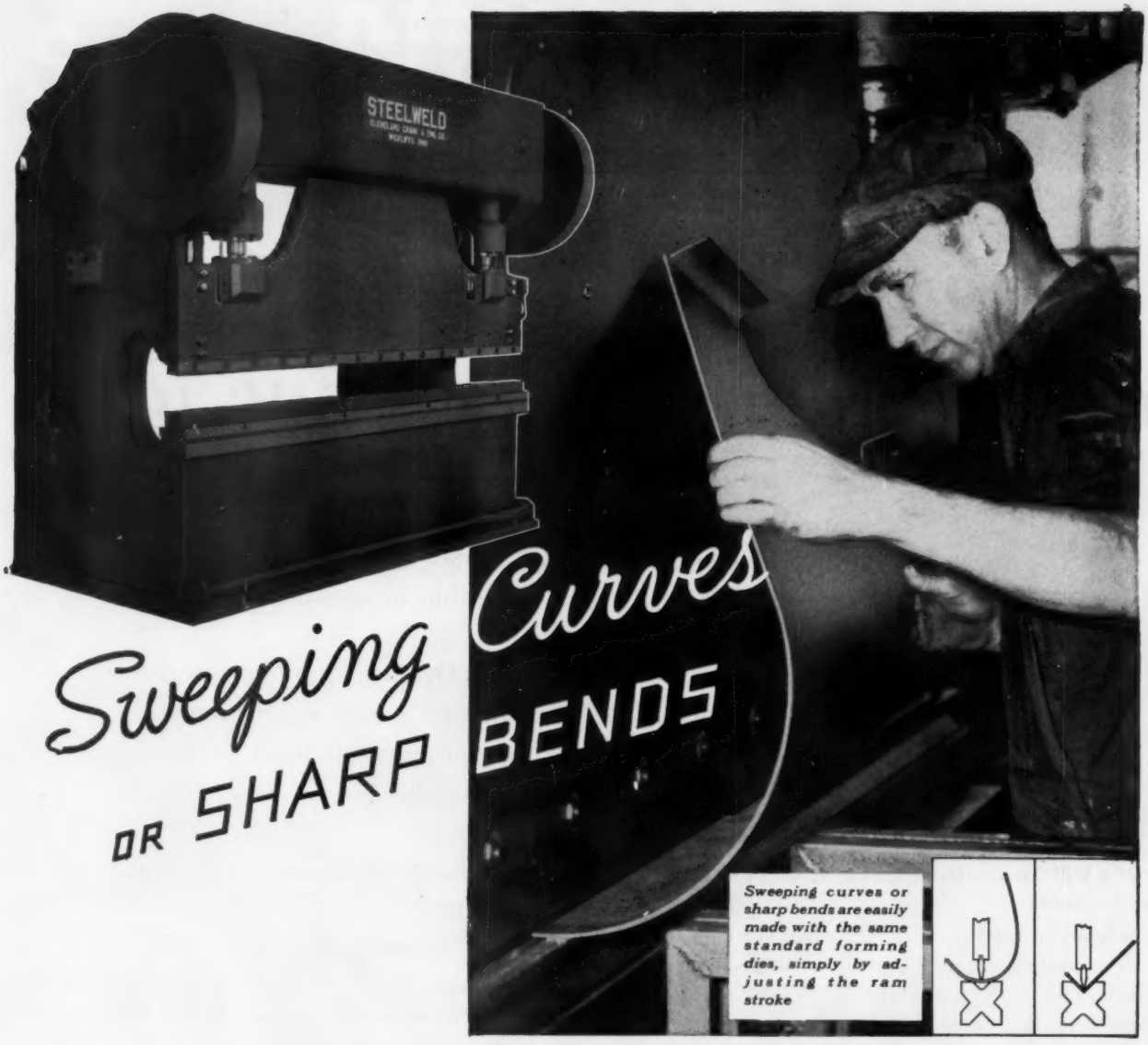

Sweeping Curves OR SHARP BENDS

Sweeping curves or sharp bends are easily made with the same standard forming dies, simply by adjusting the ram stroke

For decades plate has been sharply bent — or curved — corrugated — punched — and formed into various shapes. But can you think of any ONE method or machine prior to the development of the bending press, that could perform all of these operations speedily and easily?

In this modern world where efficiency is becoming ever more important, no one working with plate in thickness up to an inch can afford to be without a bending press. As applied to metal forming, it is a lathe, a shaper, a planer, a boring mill and drill press, all rolled up into one.

Sweeping curves and sharp bends are only a few of the many operations that can be performed on a Steelweld. With dies available, and simple ones that are easily made, the kinds of work that can be produced are practically limitless.

Now, more than ever before, it is important that you be keyed up to do all kinds of forming work with dispatch and accuracy. We urge you to get the facts on this modern tool.

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how "PAYD" helps you acquire modern machine tools

C. I. T. Corporation's new "PAYD" Plan ("Pay-As-You-Depreciate") can help you replace your inefficient or obsolete tools—on a sensible basis that is tied directly to the fast, favorable depreciation aspects of the new tax law.

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"PAYD" parallels your depreciation schedules

When you use the "PAYD" Plan, you pay for your new equipment with installments geared to your new, fast depreciation allowance schedules. 70% of the depreciation can be taken in the first half of the life of your new equipment. Your "PAYD" installments are arranged to meet this new, more convenient timetable.

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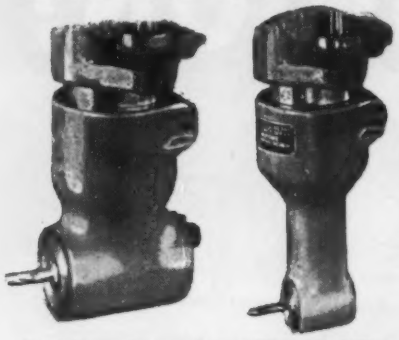

(Left) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads. (Right) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.

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Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

MILLING MACHINE VISE

Improved and providing great gripping power, with large diameter screw for rigid holding. Streamlined for appearance and equipped with coolant trough. Two sizes: 5"x3½" and 6"x5" jaw openings.

A few of the Attachments available

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add unprecedented versatility in productive ability

"Bridgeport Millers" in themselves are universally recognized as machines of outstanding utility. Their exclusive method of being able to drill, mill, bore and shape over a wide area without changing set up, has contributed much to their universal acceptance through the convenience, economy and accuracy offered. But this is not the whole story . . .

Note the attachments shown above. Here are a few means developed by "Bridgeport" engineers to go still further in extending the versatility of these machines . . . attachments which mean not only greater convenience but which vastly extend the operations which can be performed . . . attachments which will enable one machine to do the work of several single purpose machines. Furthermore, many more jobs can be assigned to the "Bridgeport" with the result that many more productive hours are available from one machine.

Ask your dealer . . . or us . . . to show how you, too, can apply Bridgeport Attachments to extend the utility of your machines. Ask also for literature on Bridgeport Turret Milling Machines.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

Advantages of Worm Gearing

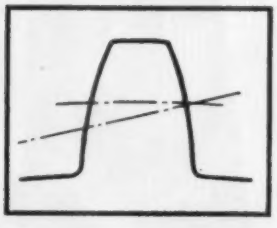
By J. E. GUTZWILLER

Assistant Chief Engineer, Worm Gearing Department

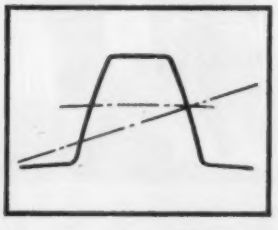
De Laval Steam Turbine Company

Interchangeability—The De Laval Steam Turbine Company was one of the first, if not the very first, manufacturer of heavy duty machinery to build worm gearing with interchangeable parts manufactured under limit gage control. Thus, worm and gear sets of like center distances but of different ratios can be readily interchanged if revision of speeds becomes necessary. Standard parts are always available for maintenance.

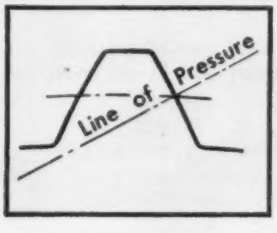
High Shock Load Capacity—The worm gear tooth form is such that the gear teeth are under a crushing, rather than a bending load. For this reason extremely high momentary and shock loads, damaging to many forms of gearing, can be successfully withstood. High momentary overloads seldom cause failure, as worm gear ratings are figured on the wear resistance of the gear teeth.



Standard 14½° involute spur gear tooth and old time worm tooth.



20° stub gear tooth.



De Laval Worm Gear Tooth. Note, line of pressure falls inside base of tooth.

Long Life—Bronze gear teeth maintain their correct form due to the regenerating action of the hardened steel worm, which retains its original shape throughout years of wear. A worm gear drive actually improves with service. This fact is peculiar to worm gearing and contributes to its recognized long life.

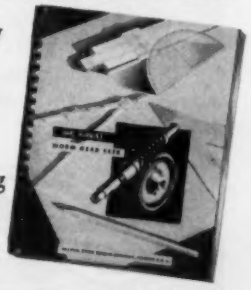
Smooth, Quiet Power—De Laval worm gearing transmits power by a continuous shockless action. Three or more teeth are in contact at all times, giving an even flow of torque and uniform angular velocity and eliminating vibration, pulsation, chatter and customary gear noises.

Compact Right Angle Drive—The use of worm gearing makes a neat, closely coupled, compact drive, with the motor shaft at right angles to that of the driven machine.

Larger Gear Ratios Simplify Design—Worm gearing offers larger ratios of speed reduction in a single compact set, another space-saving feature for the design engineer. The larger gear ratios obtainable in a single worm and gear set reduce the number of moving parts required.

Safety and Ease of Maintenance—The small number of moving parts in a worm gear drive may be readily enclosed, thus avoiding the hazard of exposed moving parts. Assuming proper lubrication, worm gearing operates with minimum attention, even under the most adverse conditions.

Reference Manual On Worm Gear Sets



Design engineers will find this new catalog a helpful working tool in the selection of worm gear sets. It contains examples of how to select worm gearings, worm and gear data, standard worm mounting dimensions, horsepower ratings, data on shaft stresses as well as other information.

Write on your business letterhead for Catalog 5000 to De Laval Steam Turbine Company, 887 Nottingham Way, Trenton 2, New Jersey.

DL 285

(Advertisement)

this simple idea cuts V-Belt costs

— as a V-Belt bends, feel its sides change shape!

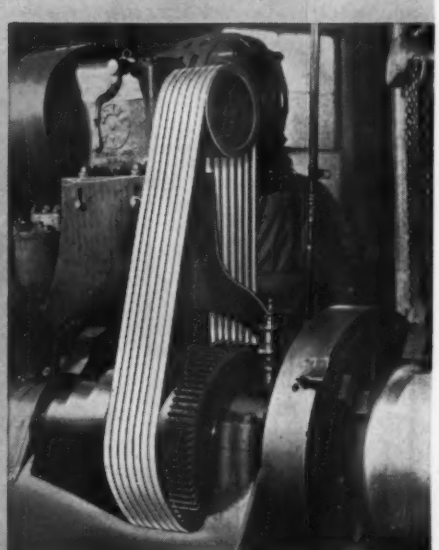
Pick up *any* V-Belt that has straight sides (Fig. 1) and bend it as if it were going around a pulley. At the same time, *grip its sides* with your fingers! You will feel the sides *bulge out* as in Fig. 1-A. Clearly, the bulging belt is forced to press *unevenly* against the V-pulley—and this concentrates wear at the points shown by arrows (Fig. 1-A).

Now bend the belt with CONCAVE SIDES

(U.S. PAT. 1813698)

. . . the GATES VULCO ROPE (Fig. 2)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* and become perfectly straight. This belt, when bent, *precisely fits* its sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. Therefore, wear is distributed *uniformly* across the full width of the Gates Vulco Rope—and this means longer belt life and *lower belt costs* for you!



Typical Gates Vulco Rope Drive—the Gates V-belts are built with Concave Sides to insure longer belt wear.

When you buy V-belts, be sure to get the V-belt with the CONCAVE SIDES — the Gates Vulco Rope!

VULCO ROPE DRIVES

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Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

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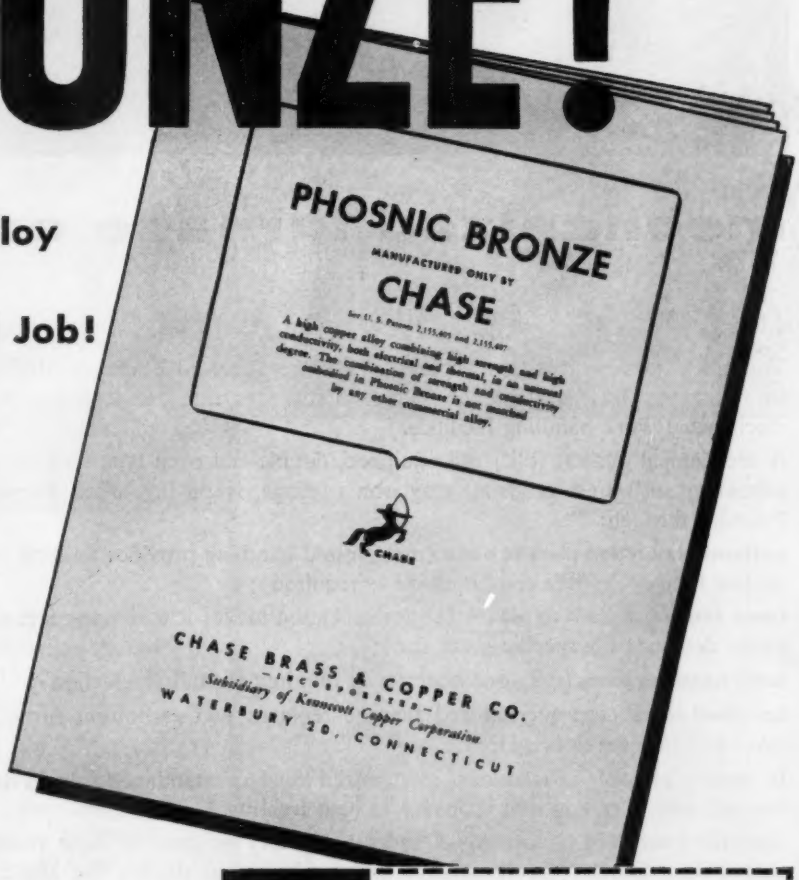

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In dozens of other installations, mechanized 'Surface' standard furnaces have brought new precision and economy to heat treating.

Send for Literature Group H54-8 and get the story on some of these installations. Your 'Surface' representative will be happy to discuss the standard furnaces and mechanisms to reduce your heat treating costs.

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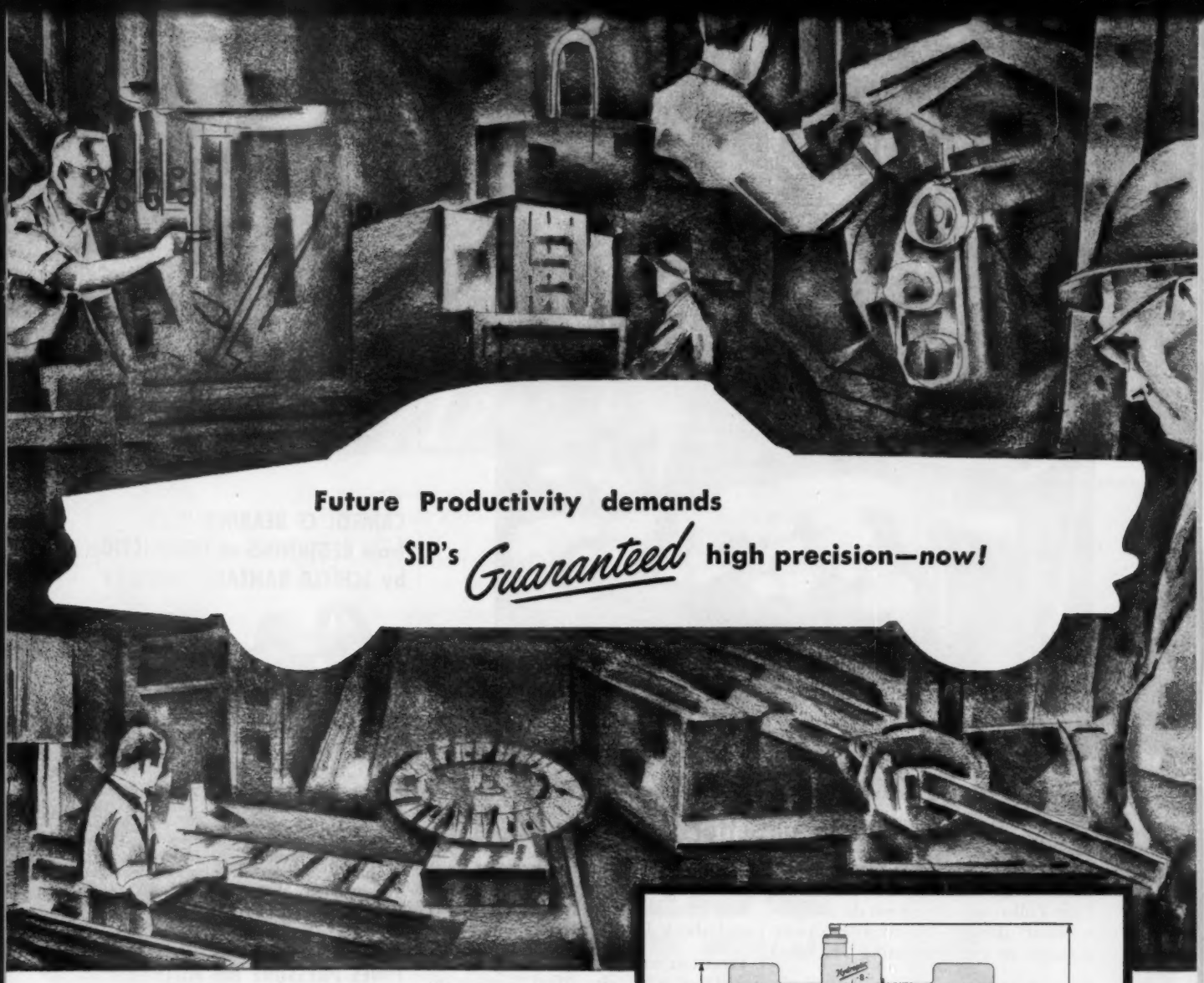

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Basic to your present and future tooling programs are SIP Hydroptic Jig Borers. However exacting your precision standards, however intricate and voluminous your production, it is the SIP Hydroptic which will define and establish an essential *basic* Accuracy in your plant—and reliably maintain it during the busy years to come.

SIP offers you a *guaranteed* setting Accuracy: within .0002" on the large Hydroptic 8P's and 7P's, and within .00015" on the medium size Hydroptic 6. For complete details, see your nearby SIP Distributor, or write directly to

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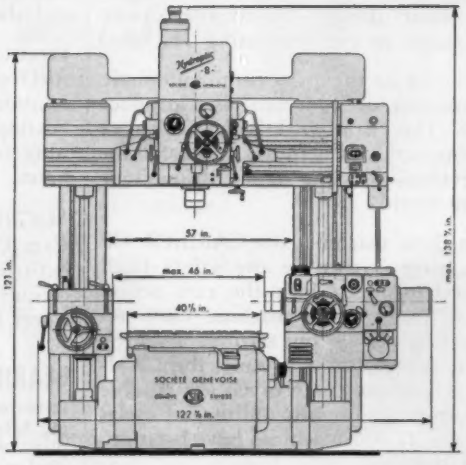

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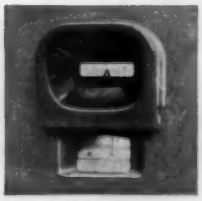
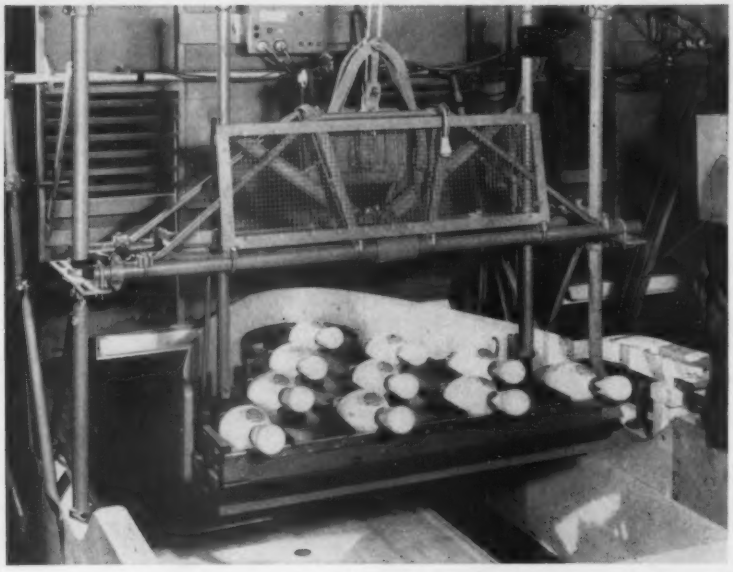
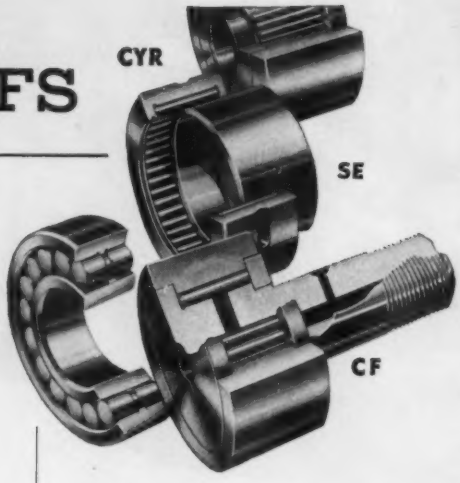
SIP *for precision*

The divisions on the Hydroptic's Standard Scales are magnified 22.5x on to Viewing Screens. They give you *"a tenth at a glance,"* with nothing to wear out—ever.



McGILL BEARING BRIEFS





CAMROL CF bearings ADD TO SAFETY of 22,000 Brunswick-Balke-Collender semi-automatic pinsetters now in use

When the pinboys "set 'em up in the other alley" a McGill CAMROL Cam Follower helps them do the job without danger to themselves or damage to the pin-setting machine.

Known as the B-10 Semi-Automatic Pinsetter, this machine is a product of The Brunswick-Balke-Collender Company and is in use on 22,000 individual bowling lanes throughout the world.

In these machines the CAMROL CF bearing is used in the safety latch mechanism to lock the cam action and prevent the machine from recycling during pin setting. Used by the company for 4 years, the CAMROL bearing has given no trouble despite the literally millions of cycles these 22,000 machines have been operated.

CAMROL Cam Follower bearings utilize a full complement of small diameter followers with outer race and integral stud and flange custom heat treated for the ultimate in radial and shock load capacity.

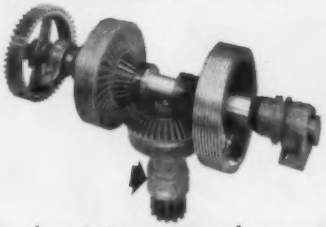
Precision tolerances on all grinding surfaces with simplified lubrication minimizes internal wear and increases bearing life. Both starting and running friction are reduced to a minimum.

McGill designed and built the first Cam Follower and used 20 years of experience with thousands of applications to perfect the right Cam Follower for any cam action application.

BEARING SELECTION GUIDE

A revised 140 page Bearing Selection Guide, complete with 30 pages of vital engineering data, has been released by the McGill Manufacturing Co. Ask for Catalog No. 52.

CAMROL CF BEARING USED from BEGINNING of PRODUCTION by SCHIELD-BANTAM COMPANY



More than 5,500 cranes and excavators built by Schield Bantam since 1945 use CAMROL CF Bearings in SHIFTING COLLAR vertical swing shafts and drum clutch applications. With maintenance negligible and performance excellent the manufacturer asserts, "Using CAMROL CF Bearings offers an overall price advantage and insures maximum product quality."

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Pines Engineering Co., Inc., has used the CAMROL CYR Bearing for 6 years in tube bending machines and has never had a failure. The bearing takes the full bending moment in Pines pressure die holders that bend extra heavy pipe in sizes ranging from ¾" to 4" without scratching the tubing.

50th Anniversary

McGILL design leadership has given you these important developments

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How Men and Controls Protect Industry's Confidence in *Carpenter* High Speed Steels

The *performance* you get from high speed steels is directly related to *how* they are produced. As a specialty mill where quality overshadows tonnage . . . and all operations are set to this standard . . . Carpenter devotes the time and attention required to produce high speed steels of the finest quality.

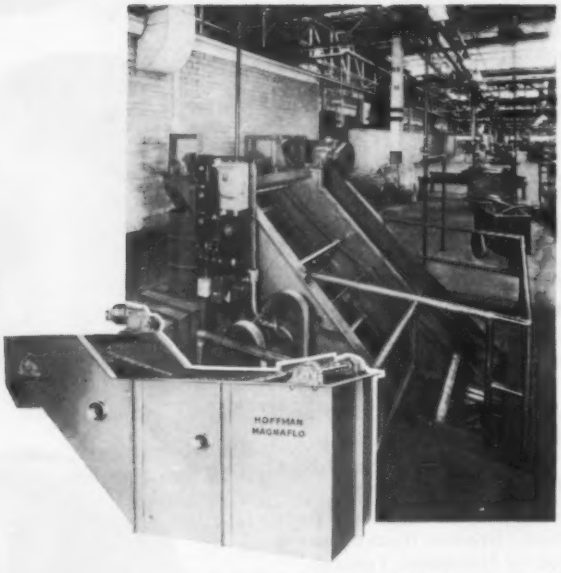
From careful scrap purchasing to guaranteed analysis, and painstaking time and temperature checks during melting . . . through rigid controls of bar reduction in rolling, and many other quality tests at all steps . . . these are the "indispensables" that have enabled Carpenter to produce the finest High Speed Steels for 60 years. And most important is the *personal attention* Carpenter men give to every order. The experience, pride and skill these craftsmen put into the production of every bar make Carpenter High Speed Steels your most dependable investment. Your best proof is to place your next order with Carpenter . . . and see what a difference there *can* be in High Speed Steels. THE CARPENTER STEEL COMPANY, 109 W. Bern St., Reading, Penna.

Every Order of *Carpenter* High Speed Steels Undergoes These and Many Other Quality Controls

- All scrap must be of purest quality, guaranteed analyses.
- Small, electric furnace melting units are used to control quality and uniformity to the highest degree.
- Every heat of steel is constantly checked for chemistry, temperature and melting time.
- Preheat and high heat furnaces are guarded for accurate time and temperature to prepare the steel for rolling.
- Percentage of reduction in cogging billets for rolling or forging of bars is skillfully controlled to assure freedom from internal stresses.
- Discs cut from each bar are acid etched, examined, hardened and fractured to certify internal cleanness, soundness, freedom from excessive segregation. And the hot acid etch is backed by Ultrasonic Testing.
- Slugs are cut from each lot of billets and machined in "step-down" fashion to guard against internal seams, shadow lines, etc.
- Extensive laboratory tests are made for proper hardness, micro-structure, grain size.
- Turning tests are run regularly to check cutting efficiency.
- *For best results, put your confidence in . . .*

Carpenter STEEL high speed steels

when a HOFFMAN MAGNAFLO joins the grinder line... watch production gain 40% and more!



ELECTRIC AUTO-LITE COMPANY, at Lockland, Ohio, has the MAGNAFLO unit under the floor, with sludge discharging into carts at floor level.

Machines stay on the go, wheel dressing is greatly reduced, down-time for coolant tank cleaning is eliminated and your grinding department shows a huge increase in output — when a Hoffman Magnaflo starts clarifying the grinding coolant.

This low-cost, automatic, self-cleaning unit pays for itself in a hurry. It combines the settling tank method for removing both ferrous and non-ferrous material and a dense magnetic field for trapping most of the other metallic solids — with a continuous full flow of clean coolant supplied to the wheel at all times.

Most grinding operations require no further oil cleansing. In high precision work that calls for actual filtration, the low solids content in the oil provided by the Magnaflo keeps the filters working far longer and cleaner, substantially reducing maintenance.

The large Magnaflo installation, followed by pressure filtration, at Saginaw Steering Gear Division of General Motors, is giving such excellent performance that the actual savings are running greater than the anticipated 40%.

Look into the kind of returns you can get from grinding oil clarification. Let Hoffman engineers chart actual performance for your operations — and show you detailed case histories from the country's most demanding manufacturers.

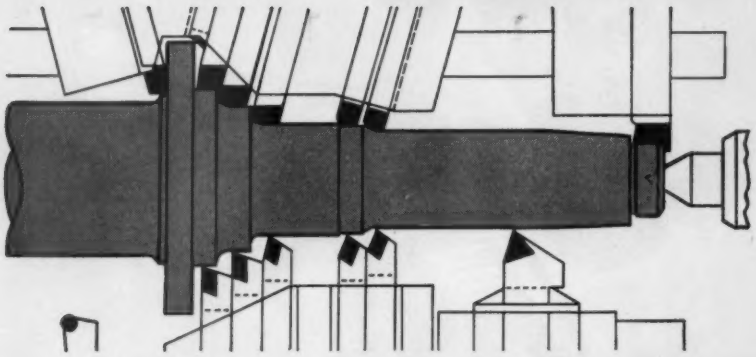
write or wire

U.S.HOFFMAN MACHINERY CORPORATION

Industrial Filtration Division

DEPT. A.M., 105 FOURTH AVENUE, NEW YORK 3, N. Y.

THE TURNING POINT TO HIGHER PROFITS!



PRODUCTION RATE—UP 25%, TOOL COST—DOWN 40% AT LARGE MID-WEST TRACTOR PLANT

PART.....Shaft Steering Clutch, SAE 8654-H Brinell 370.
OPERATION.....Rough Straddle Face Flange, turn all diameters, form undercut and base.
MACHINE.....16 x 60 Sunstrand Automatic Lathe.
TOOLS.....8 Talide-tipped facing, chamfering, radius and form tools Grade S-88. 7 Klamp-Lok Toolholders with round, triangular and parallelogram Talide inserts Grade S-88.
DEPTH OF CUT..9/32" to 7/16"
FEED.....022
S.F.M.....156
RESULTS.....Production up 25%—Scrap and rejects down.

A FULL LINE OF TALIDE TIPS IS AVAILABLE IN OVER 1000 SIZES, STYLES, SHAPES AND GRADES—TO MEET EVERY MACHINING REQUIREMENT

NEW IMPROVED CUTTING GRADES

An extensive 2-year research and development program has resulted in a completely new and improved series of Talide Metal grades for all-purpose machining. "Double-carbides" containing tantalum carbide and tungsten carbide have been perfected for cutting cast iron and non-ferrous alloys, and "triple-carbides" containing tantalum carbide, titanium carbide and tungsten carbide for machining steels.

Major improvements have been made in our rigidly controlled vacuum furnace technique. This, along with additional refinements in our process has resulted in the creation of a carbide having a new, unique grain structure possessing harder and tougher properties than previous grades.

Laboratory tests reveal that these new, improved grades have 25% greater strength and rigidity. Extensive field tests have proven that service life per grind is increased up to 50% over previous grades. **Metal Carbides Corporation, Youngstown 7, Ohio.**

Send for new 84-page Catalog No. 55-G.

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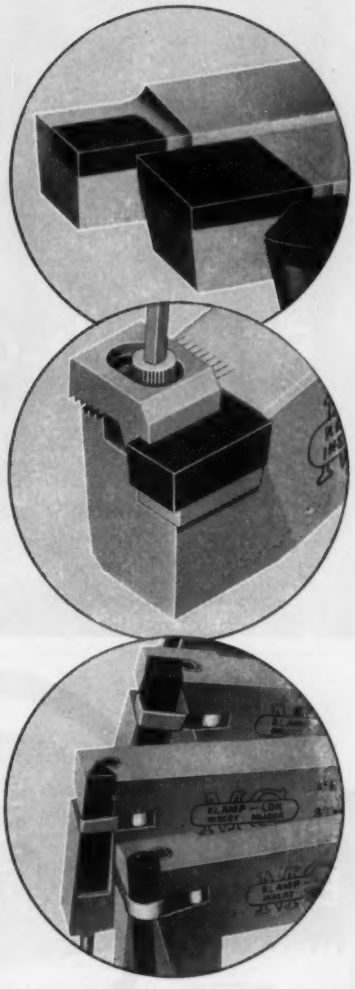

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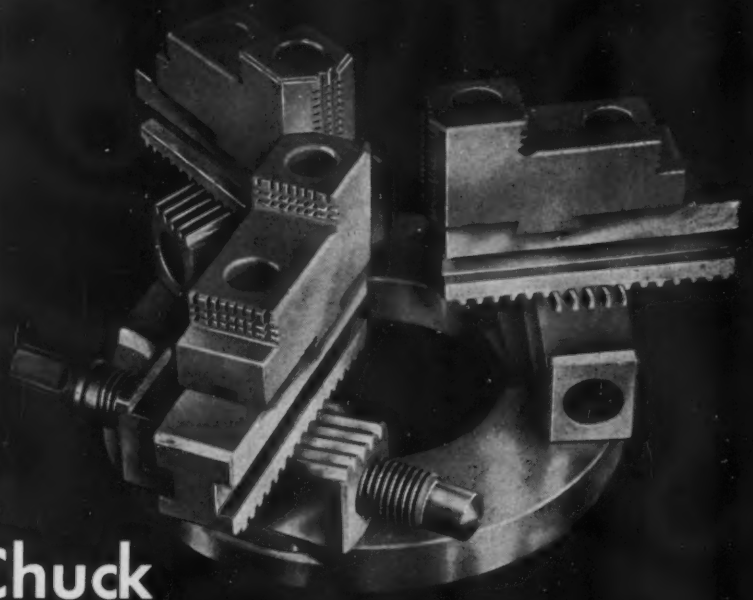
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



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No bevel wheels and spiral threads with their inherent deficiencies –
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Highest gripping power – High resistance to wear –
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RC 250

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HACKSAW represents the latest addition to the SAJO line of Hacksaws built by Sweden's largest Hacksaw manufacturer. This Heavy Duty 10" x 10" Production Hacksaw incorporates the unique feature developed by SAJO providing instantaneous finger-tip controlled cutting pressure insuring maximum cutting efficiency and saw blade life. Designed for simple fool proof operation and incorporating the sturdy construction and painstaking workmanship on which the SAJO reputation has been earned, the Model RC 250 represents an outstanding value in this type of metalworking equipment. Also available are, SAJO Utility Hacksaws; Model RC 30 6" x 6" and Model RC 45 9" x 9".

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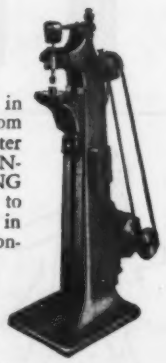
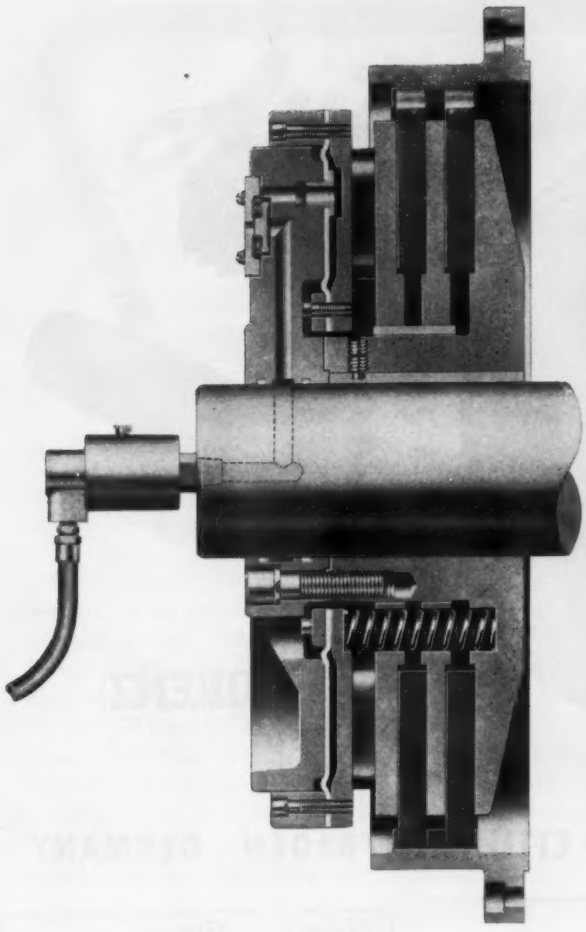
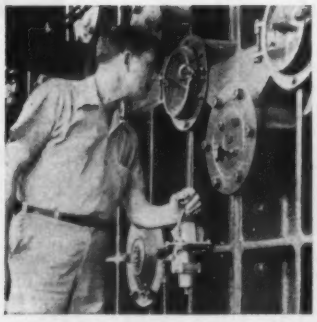




DODGE AIR-GRIP CLUTCH

Announcing a NEW Air Clutch with Amazing Sensitivity . . . Cooler Operation . . . Extreme Compactness . . . Built-in Quick Release Valves



Finger tips on the throttle bring instant response, give the operator split-second control. This new product of Dodge is the quickest-acting air clutch available!

New design and engineering by Dodge achieve this exceptional control—in a clutch that provides maximum torque capacity in minimum space. Less air is used to operate the clutch—the result is a new sensitivity that enables the operator to "inch" the clutch, or to throw it into full engagement as required. Where instant disengagement is needed, quick release valves are built into the clutch itself, as optional equipment.

The unique design of the Air-Grip Clutch places the air seal disc at the end *farthest* from the pressure plates, which generate the heat inherent in clutch operation. This, combined with automatic internal ventilation, insures cooler operation and longer life under severest service. Provision is made for mechanical engagement of the clutch if the air supply should fail.

Thorough tests in the field as well as in the laboratory assure you of Dodge dependability in the Air-Grip Clutch. Available in sizes from 8.5 to 460 hp at 100 rpm at 80 psi. Call your local Dodge Distributor or write for Bulletin A634.

DODGE MANUFACTURING CORPORATION
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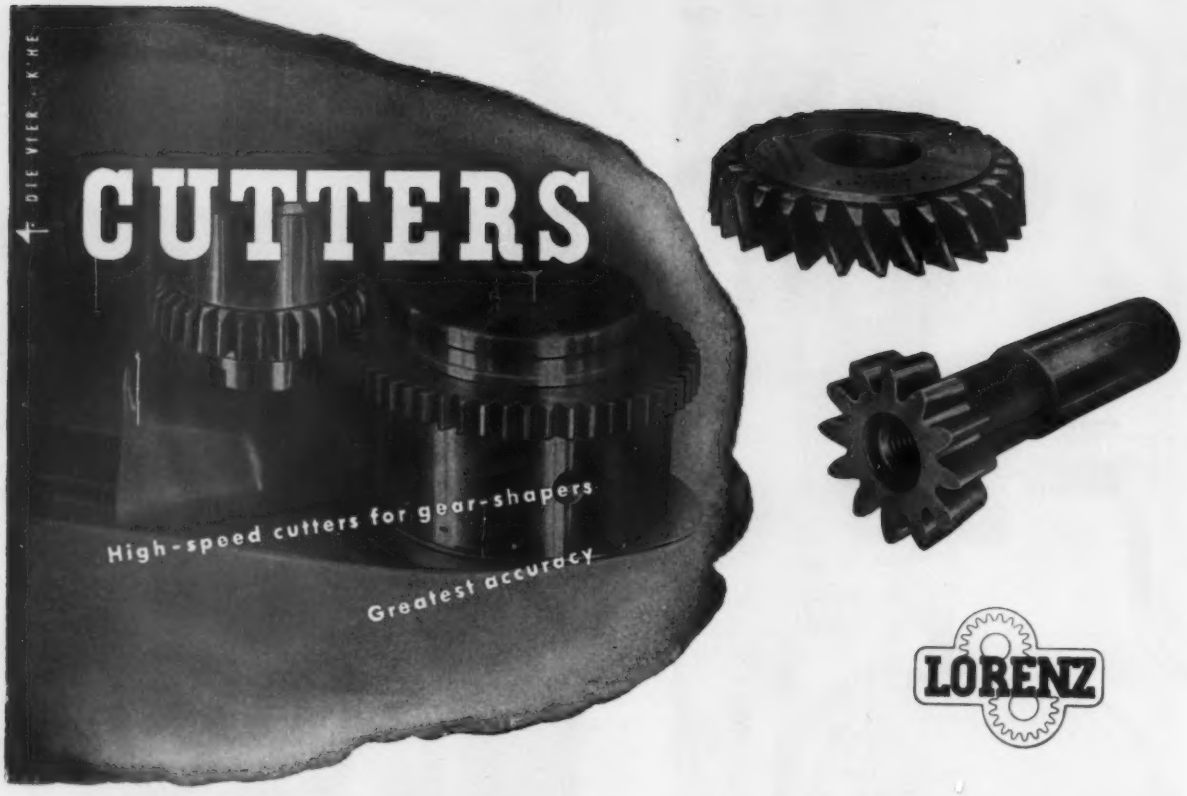
Sixty years of experience in serving industry's clutch needs . . . manufacturer of the famous Dodge Diamond D and Rolling Grip mechanical clutches.

Call the Transmissioneer, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified telephone directory, or write us.



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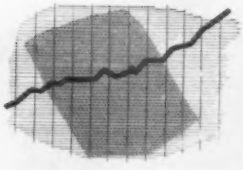

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How to estimate the time element in any machining job

Use this manual to make the winning but safe bids that mean more jobs and better profits for your shop.

Machine Shop Estimating

BY W. A. NORDHOFF
Douglas Aircraft Company, Inc.

Here's the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine shop large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time.

It covers every step—from setting up a job, to tearing it down—giving the specific time value established for each element. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating particular jobs on each type of machine in use today.

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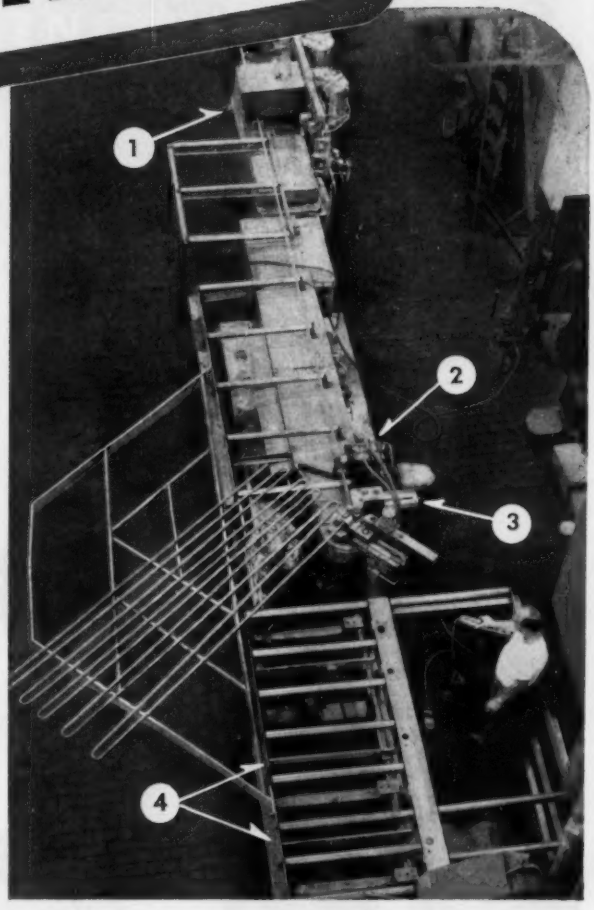
Automation IN COIL BENDING

How Serpentine Coils Are Now Produced in One Continuous Operation on PINES Size 1¼ Production Bender

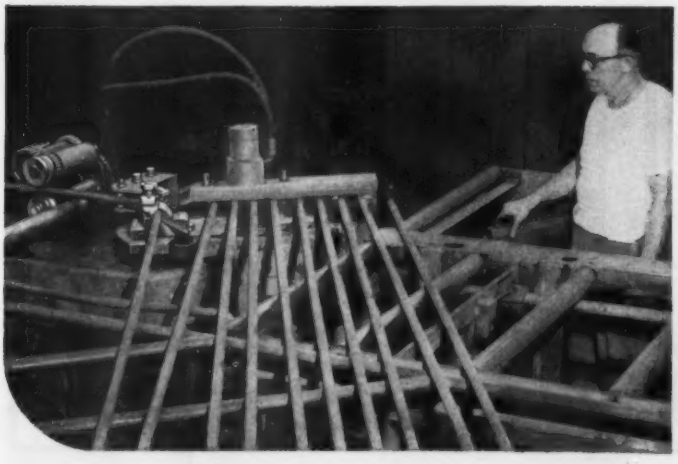
● At Carrier Corporation, Syracuse, N. Y., large serpentine air conditioning coils are now completely formed in one, continuous bending operation on a Pines Size 1¼ Production Bender equipped with a flash welder, automatic feed roll, and turn-over fixture. By former methods, three machines were required to meet production needs, and after bending, from 64 to 128 welds were necessary to fabricate a complete cooling unit. In addition to the slow, inconvenient welding procedure, a considerable amount of stock cutting and work handling was required.

COILS NOW PRODUCED AT 200 BENDS PER HOUR

Today, with the new Pines equipment, complete serpentine coils are now formed with little work handling. Straight lengths of stock are butt-welded together before bending which permits completing the coils in one, continuous operation. This method reduces the number of welds and stock cutting because long lengths of stock are used. Scrap losses are reduced as much as 80%, and since the entire operation is mechanized, work handling is substantially reduced. The result — complete coils are now produced on one machine with two operators at a production rate of 200 bends per hour.



▲ Over-all view of Pines installation at Carrier Corp., Syracuse. Handles standard pipe ranging from ¾" up to 1¼" sizes. The unit combines (1) welder, (2) feed roll, (3) bender, and (4) turn-over fixture.



◀ Closeup view showing automatic feed roll and tooling. Hinged clamp die with angular cam surface and mating plate permits clamping workpiece without interfering with formed coil. Long, horizontal clamp holds ends of coils to prevent distortion during sweep of bending arm.

WRITE FOR *Free* DATA SHEETS

For more information on latest developments in production bending, write for copies of "Pines News". Describes and illustrates how production bending is helping cut manufacturing costs on a wide variety of jobs.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery 672 WALNUT • AURORA, ILLINOIS

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An early order
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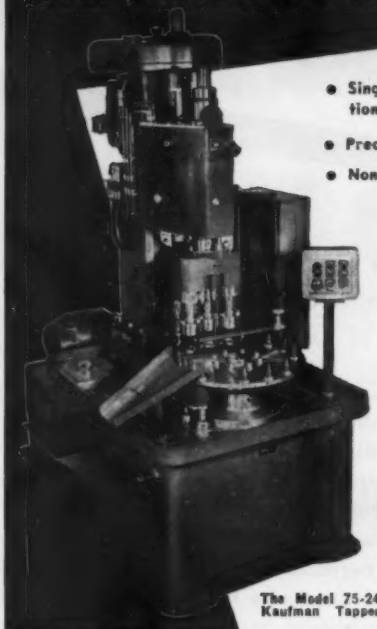

- Single or Multiple Operations
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- Non-reversing Motor Drives
- Pressure Lubricated Lead Screws
- Fast, Accurate Rugged Index
- Other Head Units Available
- And Many Other, Worthwhile Features

Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

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GEARS AND PINIONS *help Auto Parts Industry*

The automobile parts fabrication industry needed heavy-duty gears for use on forging equipment. Stahl supplied the 2-ton gear and pinion set shown above. Made to exact specification, superbly machined, promptly delivered, they are giving flawless performance. For your particular gear needs give Stahl the next job. Write for estimate.

SPURS TO 72" PD, 1 DP
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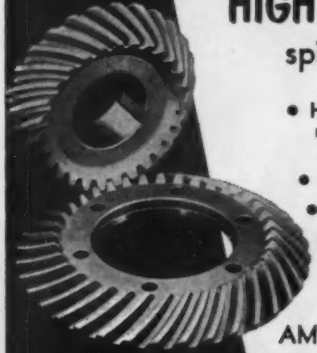
spiral bevel gears



- Heat treated and lapped in matched sets for high speed operation.
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- Production lots only
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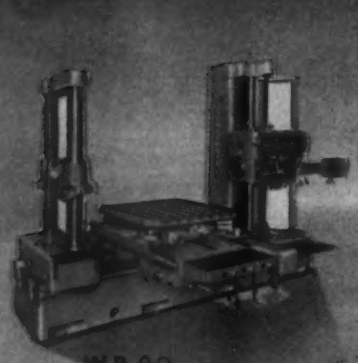

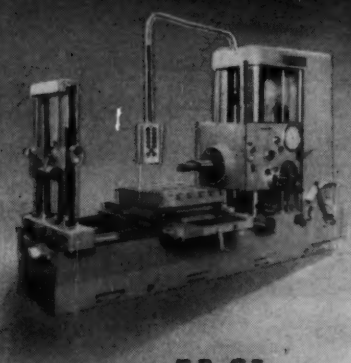

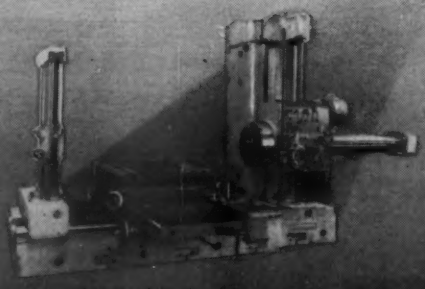

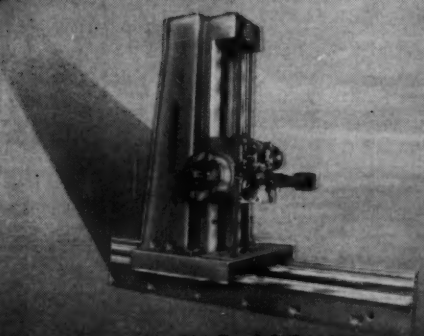

SCHARMANN MACHINE CORPORATION

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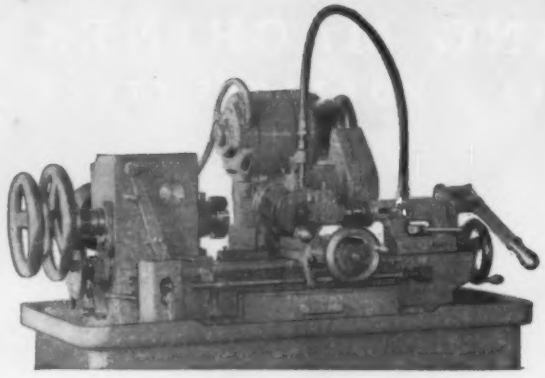
IMPROVED **WALTHAM** THREAD MILLING MACHINES



Several improvements in design have recently been made that are not mentioned in our descriptive bulletin. Send for supplementary sheet that lists these improvements and presents an illustration of the whole machine.

WALTHAM MACHINE WORKS, INC.
HIGH STREET, WALTHAM, MASSACHUSETTS

APEX TOOLS

INSERTED-BLADE MILLING CUTTERS

Here's a PRODUCTION Cutter

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HEAVY DUTY JOBS

APEX offers many cutters for many jobs. Here's one that takes a big chip fast. It can be had with H.S.S., Stellite, Cobalt or Carbide tipped blades. These blades adjust automatically in two directions. No damage to carbide tips. Diameters from 8" to 24". We also make cutters for *lighter* work. Write for catalog.

APEX TOOL & CUTTER CO., Inc., Shelton 10, Conn.

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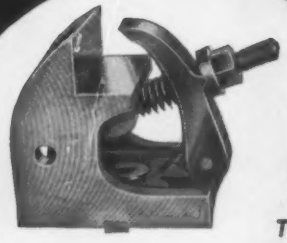

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"Masters of A Thousand Set-ups"

Eliminate the need for many special expensive jigs and fixtures.

You will save time and money on most set-ups with Hart Milling Fixtures. They hold round, hexagonal, octagonal or square stock, for miller, shaper, drill press and tapper; they reduce set-up time and speed production. Hart Milling Fixtures are made in four useful sizes, and designed to be used in horizontal or vertical position. Let us send you full description and prices.

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BIG PARTS—Sterling Engine Company checks surface finish on crankshafts, camshafts, milled surfaces, gear teeth, and other work with the SURFINDICATOR. It's portable and can be used right on the job!

"SURFINDICATOR—*Eliminates arguments on surface finish!*"

"ALTHOUGH IT IS DIFFICULT to estimate the savings made possible with gaging equipment," states Sterling Engine Company, "we have realized definite dollar savings with the Brush SURFINDICATOR* just through the elimination of arguments." Sterling uses the SURFINDICATOR to check finish on many precision parts where a microinch finish is specified.

The SURFINDICATOR speeds inspection, saves time, and can help *you* eliminate costly overfinishing. It can be set up easily for operation by shop personnel. Write for booklet—or ask for a demonstration of the SURFINDICATOR in your plant. Brush representatives are located throughout the United States. In Canada: A. C. Wickman, Ltd., Toronto.

*Trade-Mark

BRUSH ELECTRONICS COMPANY
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Brush Electronics Company is an operating unit of Clevite Corporation.

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SMALL PARTS—Chance Vought Aircraft, Inc. checks interior smoothness of fuel valve poppets used in the Cutlass jet fighter with the Brush SURFINDICATOR. Interior surfaces are measured with aid of small-bore pickup.

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3405 Perkins Avenue, Cleveland 14, Ohio

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☐ Have your nearest representative demonstrate the SURFINDICATOR to me.

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Position _____
Company _____
Address _____
City _____ *State* _____

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** EQUIPMENT: USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line

Position Wanted advertising rates are ½ the above rate payable in advance.

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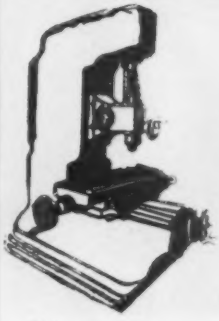
PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

MACHINE TOOL RECONDITIONING & the Art of Hand Scraping
— illustrated —
Write today for folder describing book
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabasha Sts.
St. Paul 1, Minn.



SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

First, read the dealer ads on the following pages. A 5-minute study may locate the equipment now.

Second, send in the specifications of the equipment wanted on the coupon below, or on your own company letterhead, to

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., New York 36, N. Y.

Please help us locate the following used equipment:

.....

.....

.....

.....

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

1/17/55

Opportunity For Progressive Metal Working Firms...

Leading Belgian Steel Works seeks connection with U.S. industrial plants for manufacture under license of various products. Company makes hoisting and handling equipment and operates important cold drawing mill and hot forging plant for bolts, etc. Inquiries should be addressed to:

MARCEL LOEB & COMPANY, Inc.
30 CHURCH ST.
NEW YORK 7, NEW YORK

MACHINE SHOP, San Francisco

Net $47,092 in 7 months—after taxes! Started in 1946 on a shoestring, now debt free! Good industrial location. Complete equipment in good condition. Very reasonable price. Terms. #21262.

FORD
6425 Hollywood Bl, Los Angeles 28, Cal.

WANTED
MACHINE TOOL MEN

To Become Salesmen for large New York dealer in eastern territories. Excellent opportunity for qualified persons. Mail complete details and resume to

SW-5090, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

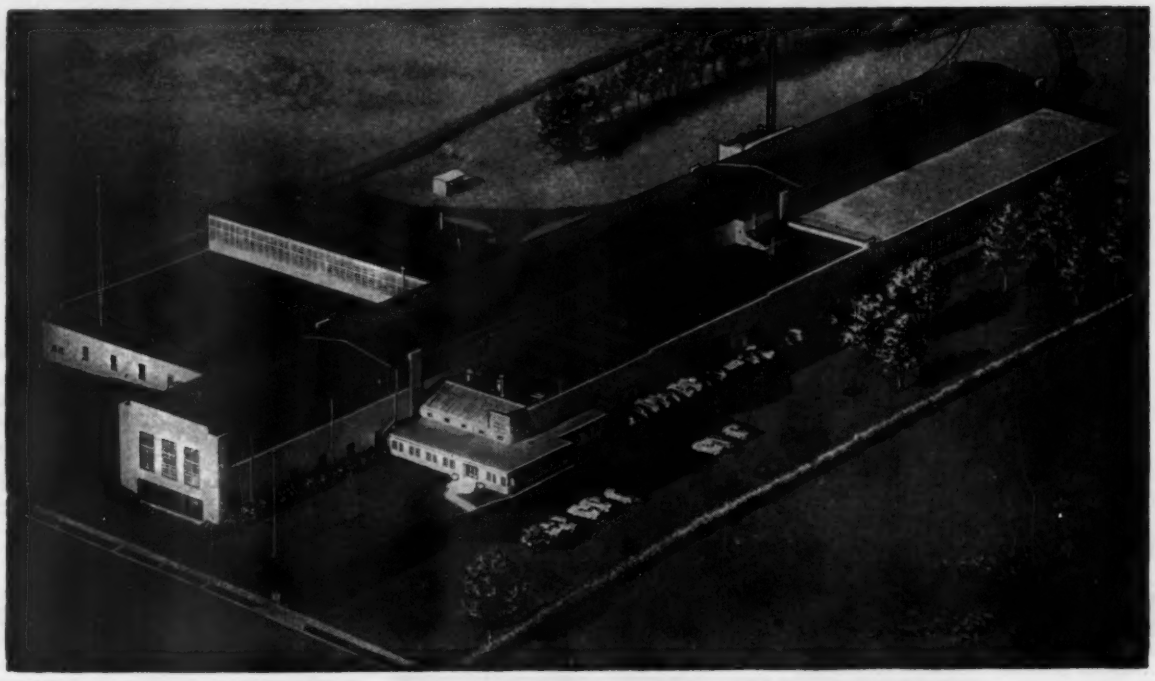
MANUFACTURERS' REPRESENTATIVES — To represent large mid-western manufacturer of speed reducing transmissions and cut gears of all types, on a commission basis, for territory of Detroit, Michigan or Birmingham, Alabama—must be experienced in engineering and sales. All replies will be held strictly confidential. RW-5106, American Machinist.

CONTRACT WORK

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
2233 Beck Street Cincinnati, Ohio

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY



GEAR GRINDING MACHINES

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur & Helical
No. 13LS Fellows Gear Lapper, m.d.
SG11 Gear Grinding Machine, m.d., latest
GG19 Gear Grinding Machine, m.d., latest
GG 31 Gear Grinding Machine, Internal Gear & Spline Grinder, m.d.
10" Pratt & Whitney Model M1639 Single Wheel Gear Grinder, m.d.

GEAR HOBBING MACHINES

No. 120H Gould & Eberhardt Double Head Universal, latest
Type A Barber-Colman, m.d.
No. 5AC Lees-Bradner Heavy Type Gear Generator, m.d.
No. 12 Barber-Colman Double Overarm, m.d.
No. 12 Barber-Colman Single Overarm, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe, m.d., Spur & Spiral

GEAR TESTERS

No. 1 Brown & Sharpe Spur Gear Tester
12" National Broach & Machine Co.
18" National Broach & Machine Co.
18" Gleason Bevel Gear Tester, m.d.
No. 471 Michigan Tool Co. Hob, Reamer & Gear Checker

AUTOMOTIVE GRINDERS

Kwik-Way Model H Piston Turning & Grinding Machine, m.d., late
No. 76 Van Norman Automatic Piston Turning & Grinding Machine, m.d., late

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
No. 3 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. 3/4" valve stems, m.d.

EMERY GRINDERS

3 H.P. Baldor Emery Grinder, pedestal type
#516 Mummert & Dixon Radial Emery Grinder, m.d., 5 H.P. motor
No. 44 Excello Double End Carbide Grinder, m.d.

CRANKSHAFT GRINDERS

18x66" Landis Universal, type C, m.d., late
22"x72" Landis Type CH, m.d., late

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 73 Heald Airplane Cylinder Grinder, m.d., new
Model FG Micro Cylinder Grinder, m.d.
No. 78 Heald Centerless Cylinder Grinder, m.d.

DISC GRINDERS

No. 228 Hanchett Disc Grinder
No. 2 Gardner, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
14A Gardner Grinder, m.d.
No. 24—53" Gardner Horizontal, m.d.
No. 186—36" cap. Gardner, m.d., latest type
No. 124—53" Gardner Horizontal, m.d.

PLAIN CYLINDRICAL GRINDERS

6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
6x30" Cincinnati Hydraulic, m.d.
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x36" Landis Plain Hydraulic, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16x120" Norton Type C, m.d., late
16" raised to 26"x72" type C Norton, m.d.
18x72" Norton Type C, m.d.
No. 20—10x18" Brown & Sharpe, m.d.
20x120" Landis Plain Self-Contained, m.d.

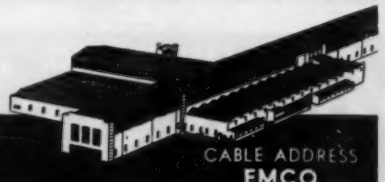
UNIVERSAL CYLINDRICAL GRINDERS

10x24" Landis Type C, m.d.
No. 3 Brown & Sharpe Universal Grinder, m.d.
6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
14x72" Cincinnati Model ER, m.d., latest type, Filmatic Spindle
12x48" Norton Universal, m.d., latest
18x66" Landis Universal Type C, m.d.

SURFACE GRINDERS

30"x86"x36" Diamond Hydraulic Face Grinder
No. 2B Brown & Sharpe, m.d.
No. 12I Hanchett Production Face Grinder, type BD, m.d.
No. 16—26" Blanchard, m.d.
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
No. A-1-8" Arter Surface Grinder

ABOVE ONLY A PARTIAL LISTING
SEND FOR COMPLETE STOCK LIST



THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS
EMCO

HILL-CLARKE MACHINERY COMPANY

ESTABLISHED 1887 — W. J. DITFURTH, President — T. H. PRICE, Vice President — J. R. MONS, Secretary

CONSULT US ABOUT REBUILDING YOUR OWN MACHINES

BORING MACHINE
100" Niles Vert. Bor. Mill

DRILLS
No. 2 Avey Cam Fd.—1 spdl.—15" sw.
No. 2MA6 Avey—1 spdl.—24" sw.
No. 2LMS L-G—2 spdl.—20" sw.
No. 2MS Allen—3 spdl.—24" sw.
No. LBM L-G—3 spdl.—20" sw.
No. 3 Avey—2 spdl.—24" sw.
4'-11" Amer. Hole Wizard Radial
No. K60H Fox Multiple

GEAR MACHINES
11" Gleason Gear Generator
No. 36BM Gould & Eberhardt
No. 615A Fellows Gear Shaper
No. 612A Fellows Gear Shaper
No. 65 Fellows. Cone Drive
No. 12HS Gould & Eberhardt

GRINDERS
No. 2—14"x30" B. & S. Univ.
No. 2 Cincinnati Centerless
No. 4H—4"x12" Landis Plain Cyl.
5"x30" Norton Cam-O-Matic
6"x18" Norton Type C Plain
10"x18" Norton Type C Pl. Cyl.
10"x36" Norton Type C
10"x36" Norton Type C Cam Gdr.
14"x48" Landis Type C Plain
16"-40" gap x 120" Norton Type C
18"x120" Norton Type A Plain
20"x192" Norton Type A Plain
24"x264" Norton Type A Plain
26"x96" Norton Type A Plain
No. TG615 J. & L. Thread Grinder
No. 81 Heald Int. Centerless
No. 74 Heald Int. Centerless
No. 72A5 Heald Int. (1942)
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16-28 Bryant Internal
No. 16A-28 Bryant Internal
No. 16F-28 Bryant Internal
No. 16-38 Bryant Internal
No. 24-26 Bryant Internal
No. 24-36 Bryant Internal
No. 24L-36 Bryant Internal
No. 22—12" Heald Rot. Surf.
No. B24—25" chuck Arter Surf.
No. 16—30" Blanchard Rotary Surf.
No. 214 Besly Dbl. End Disc
Hill-Clarke Cyl. Norton Type M.D.
10"x36" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x50" centers
14"x72" centers
14"x96" centers
18"x96" centers
18'-30" gap x 96" centers

LATHES
12"x21" Fay Automatic
No. 4D Potter & Johnston Auto.
18"x6' American Geared Hd.
27"x12' American Geared Hd.
36"x18' Putnam Geared Hd., M.D.
No. 2 Warner & Swasey Grd. Hd.
No. 2 Warner & Swasey Elec. Hd.
No. 5W Acme Universal
No. 6 Warner & Swasey, bar fd.
No. 7A Jones & Lamson
No. 2A Warner & Swasey
No. 3AL Gisholt Cross Slide
No. 3H-10 Libby International
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)

MILLING MACHINES
No. 2HL K. & T. Milwaukee Plain
No. 4 Cincinnati Dial Type Plain
No. 08 Cincinnati Vertical
No. 3K K. & T. Milwaukee Vert.
No. 4H K. & T. Milwaukee Vert.
Model A Briggs Mfg.
54"x36"x16' Ingersoll Slab
10"x48" Hanson-Whitney Thread
10"x60" Pratt & Whitney Thread
12 x102" HT Lees-Bradner Thread

PLANERS
48"x36"x14' Gray
48"x48"x12' Cincinnati
60"x48"x27' American, 4 heads

MISCELLANEOUS
No. 3L LaPointe Hyriz. Hyd. Broach
15" Dill Slotter
18" Dill Slotter
Model 200 Micromatic Hor. Hone
Model H-7 Micromatic Vert. Hone
No. 224 Barnes Vertical Hone
No. 306 Barnes Vertical Hone
No. 6 R. & K. Straight Side Press
42"-ga. Economy Shear, M.D.

FULL MONEY-BACK GUARANTEE

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. — PHONE CEntral 6-0500

FOR SALE

In Good Operating Condition
Some Never Used

2 Acme-Gridley Automatic Screw Machines, 1⅛" Collet Capacity with Complete Tooling
Verson Punch Press No. 7½, 8" Stroke, 4" Adjustment, 105 Ton Capacity, new in 1945
Clearing Punch Press, 75 Ton Capacity, 17¾" Shut Height, 6" Stroke, new in 1953, never used.

Wabash Manufacturing Co., Inc.
4700 East Wabash Ave., Baltimore 15, Md.

Indianapolis MACHINERY & SUPPLY CO.

1961 South Meridian Street
Indianapolis 6, Indiana

- TG636 Jones & Lamson Precision Thread Grinder, 1942
- HP-100 La Pointe 50 Ton Broach, 1945

Write for Complete Stock List

LATE TYPE MACHINE TOOLS

Natco Nos. G5 & 12C Drills, M.D.
Gleason 3" Str. Bevel Generator.
Hardinge H.C.T. 2nd Oper. Lathe.
P & W 30" Vert. Profiler, 2-spin.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

GEAR GENERATOR

MODEL 2A SYKES GEAR GENERATOR

Generates Continuous Tooth Double Helical (Herring-Bone) External, Internal, Spur and Helical Gears

Write or phone for our new catalog. It is packed with items from our tremendous inventory of quality machinery.

AARON MACHINERY CO., INC.
45 Crosby St., New York 12, N. Y., Walker 5-8300 — Cable: AARMACH, N.Y.

PRODUCTION MILLERS

No. 08 CINCINNATI Plain & Vertical.
Nos. 1-18 & 2-24 CINCINNATI Plain.
No. 33—1848 SUNDSTRAND Vertical.
24"x60" Fitchburg Heavy Duty Plain.

WIGGLESWORTH INDUSTRIAL CORP.
68 Border Street—East Boston 28, Mass.

MACHINERY FOR SALE
ATTENTION EXPORTERS

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher. #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FS-1633, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y

MOTORS · GENERATORS
TRANSFORMERS
NEW · REBUILT
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT CO.
PHONE STATION COLLECT — GL 6783
P.O. BOX 51 — ROCHESTER 1, NEW YORK

WORLD'S LARGEST STOCK — JOSEPH **HYMAN** & SONS

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TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34, PA. • REGENT 9-7727

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

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MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

LATHES

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type. 1942.

18"x10' MONARCH "BB" Grd. Hd. Lathe, 72" centers, Taper Attach., Flame Hardened Bed, Late Type.

24"x12' BOYE & EMMES Timken Bearing. Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

24", 36", 42" BULLARD Vertical Turret Lathe. New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

1A WARNER & SWASEY Turret Lathe, Heavy Duty, Power Chuck Wrench, Timken Bearing, M.D.

No. 2, 4, 5 WARNER & SWASEY Geared Head Turret Lathes, Bar Feed.

24"x10' AXELSON Geared Head, Heavy Duty Model "E" 28" Actual Swing, M.D. Taper Attachment. 1942.

No. 7 BARDONS & OLIVER Universal Turret Lathe. 2½" capacity. Preselector Head, Late Type.

12"x18" LIPE-ROLLWAY Semi-Automatic Carbo-Lathe, M.D., 1945.

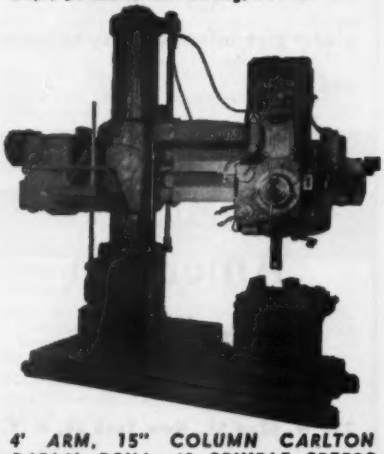
DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

No. 262 BARNES Motor Driven Sliding Drill Press. 2" cap. in steel. 1941.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press. Individual Motor Drive, Late Type. 1943.

No. M200 DEFIANCE Prod. Drill, 2" cap., #5 M.T., 26" swing, 1942.



4' ARM, 15" COLUMN CARLTON RADIAL DRILL. 48 SPINDLE SPEEDS 15-1500 RPM. MOTOR ON ARM. 1943.

MILLING MACHINES

#2-18 CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type. M.D. Late Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model. Motor Driven.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2 BROWN & SHARPE Vert. Mill, light type, swivel head, M.D., late.

No. 0 VERNON Horiz. Mill, Power Feed, Late.

5' arm x 13" column Fosdick Economax Hydraulic Radial Drill, Motor on arm, late type.
6' arm x 17" column Fosdick Economax Hydraulic Radial Drill, Motor on arm, late type.
6' arm x 19" col. Carlton Radial Drill, 20 HP., late type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hyd. H. D. Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

6'x10 ga. DIAMOND Power Shear, 1952.

6'x14 ga. PARKER Power Shear, 1948.

#7A THOMAS open back Inclinable Press 80 Ton cap. Flywheel M. D. 1948.

#5, #7 JOHNSON O.B.I. Presses. 56, 79 tons cap. M.D. Flywheel & Geared.

No. 6 FEDERAL O.B.I. Press, 65 tons cap. single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

T-56 VERSON Power Press Brake, 8' overall, late type. 100 Tons Cap. 1942.

No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944. Motor Driven.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

6"x18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late.

28" ROCKFORD Hy-Draulic Shaper, Vise, Late Type.

Nibblers 3/16"x36", ⅜"x36" SAVAGE, Motor Driven.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder. Full Equipment. 1943.

#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

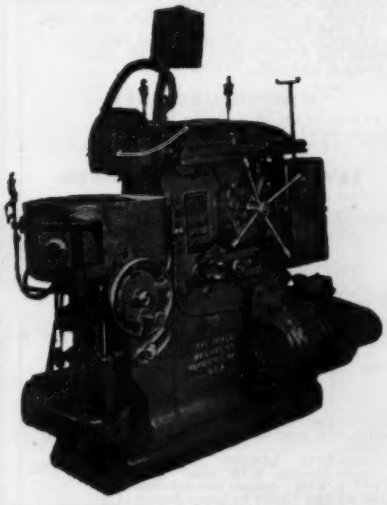
No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

12" x 24" GALLMEYER & LIVINGSTON Horizontal Hydraulic Surface Grinder.

No. 4H Landis Cyl. Hydraulic Grinder. 4"x12" Cap. Late Type. 1944.

No. 14 WD HAMMOND DOUBLE End Carbide Grinder, late type. 1950.

No. 91A COVEL Universal Tool & Cut-Carbide Grinder, late type.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK • SEND US YOUR INQUIRIES

MACHINE TOOLS 1941-1955 MODELS GUARANTEED

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter
OLIVER: 10" Template Tool Bit Grinder

DRILLING MACHINES

ALLEN: No. 2 Drill—6 spindle, 8"
ALLEN: #2½ High Speed 15" #3 MT
BARNES: No. 210 2-spindle, 21" swing
PRATT WHITNEY: ⅛Bx50" Deep Hole
RADIAL DRILLS: Archdale, 5', 6' & 7', new

GEAR & SPLINE MACHINERY

FELLOWS: #6I Shaper—35" dia.
FELLOWS: 6IA & 64A Shapers, 18" dia.
GLEASON: #12 Rough & Finish Generator
SYKES: Rack Cutting Machine 12" to 36"
FELLOWS: Gear Lappers, 8LSI and 13LSI
GLEASON: Testers, #3, #4 and #6.
NAT. BROACH: SIC-12" Rod Ring Tester
CLEVELAND: #130 & 140 Rigidhobbers
GEAR GRIND. MACH: GG-19 10"x24" Hydraulic
GLEASON: #17 Gear Grinder, 23½" P.D.
PRATT & WHITNEY: 10" Gear Grinders, 1 & 2 wheel
INTERNAL GEAR GRINDER: GG-31

GRINDERS—CYLINDRICAL

BROWN & SHARPE: #10 6"x18" plain
CINCINNATI: 6"x18" plain hydraulic
LANDIS: 16"x32" Type "D" Crankpin
NORTON: 12"x18" TYPE C Universal
NORTON: 10"x36" 30° Angle Wheel
NORTON: 10"x18" 45° Angle Wheel

GRINDERS—INTERNAL

BRYANT: #5, 16-16, 16CP16, 16-28, 24L36
HEALD: #50 Planetary
HEALD: #72A3 Plain & Sizematic
HEALD: #72A5 65" Extended Bridge
HEALD: #72A5 Plain

GRINDERS—RADIUS

VAN NORMAN: #73 capacity 7½"
VAN NORMAN: #649-16. cap. 6" to 16" dia.
VAN NORMAN: #3½, Universal

HONING & LAPPING MACHINES

BARNES: Model 172, 2" dia. x 6" stroke
MICROMATIC: H-510 double end horiz., 2" dia.
MICROMATIC: H-2 single end 2 spindle, 1" dia.
FELLOWS: 8LSI & 13LSI Gear Lappers

LATHES—PRODUCTION

BLOUNT: Speed Lathe 12"x48"
LODGE & SHIPLEY: #3A Duomatic 25½"x27"
POTTER & JOHNSTON: #4D Auto Turret

LATHES—TURRET

BULLARD: 36" Vertical Turret
WARNER & SWASEY: #1A, #2A, #3, #3A, #4, #4A and #5
HERBERT: #0, #2, #4, #7, #8 and 9B30, new
WEBSTER & BENNETT: Vertical 36" & 48"
JONES & LAMSON: #8A bar feed

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE—BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller

SAWS & CUT-OFF MACHINES

RUSSELL: 9½" Cut-Off Saw with Auto. Feed
RUSSELL: 5½" Cut-Off Saw with Auto. Feed
MOTCH & MERRYWEATHER: #3 Saw
MARVEL: #6A Hacksaw, 6"x6". Auto. Feed

THREAD MILLERS & TAPPERS

HALL PLANETARY: Mod "D" Thread Miller
LANDIS: 2½" Single head horiz. Threading
LEES BRADNER: #40A Thread Miller
LEES BRADNER: CT-36 Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. cap.
PRATT & WHITNEY: 4½x12" Thread Miller

MISCELLANEOUS

GARDNER: #84A Double Disc Grinder, 23" wheel
MOLDING MACHINES ROLLER JOLT: Osborne 2047-3
AUTOMATIC SCREW MACHINE: Wickman, Single Spindle, 7/16", new
TEST STAND: Denison 9IB-AM Hydraulic
HARDNESS TESTER: Gagan Brinell 16-S
SHEFFIELD PRECISIONNAIRE GAUGE
SUNSTRAND: Double End #53 42" & 60" Centering Machines

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BORING MACHINERY

Model 6I Excello 6-spindle cyl. borer, 1946
42" Bullard New Era vertical T/L
3½" Bar No. 32 Lucas, horizontal, table type
36" Rogers vert. T/L side head, new 1942
36" Bullard vert. T/L, side head, #11325
72" Niles Bement Pond 2 heads, PRT, #17623

DRILLS, RADIAL

3½ ft. arm 8" column American sensitive
4' arm 13" col. Carlton M.O.B.
9 ft. arm 16" column American, late type.

GEAR MACHINERY

8" Red Ring gear finisher, 1942
No. 7125 Fellows gear shaper, 1942
Type A Barber Coleman universal
No. 3 Barber Coleman std (3)
No. 12 Barber Coleman (3)
No. 12H Gould & Eberhardt universal
No. 36H Gould & Eberhardt universal

GRINDERS, CYLINDRICAL

4"x18" Cincinnati pl. hyd., plunge cut, 1946
10"x18" Norton types BA, A C, late models
10"x18" Cincinnati Sizmatic, type ER (2), 1941-1946
16"x36" Norton type C hydraulic (2), 1943
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
16"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
16"/48"x96" Landis gap type hydraulic, new 1941
No. 13 Brown & Sharpe universal tool, new 1942

GRINDERS, SURFACE

16A2 Blanchard rotary surface, serial 6046, 1946
6"x18" Norton vert. spdl, hydraulic, 1942
8"x22" No. 3 Abrasive, motor in base
12"x48" Model 300 Hanchett vert. spdl. 1946
14"x36" Pratt & Whitney vertical surface grinder, 1942.
72" No. 72 Hanchett rotary surface, 1946

INTERNAL GRINDERS

Nos. 72, 72A3 and 72A5 Heald
No. 5 Bryant semi-automatic chucking
No. 2 Cincinnati centerless (3), 1942-1943

LATHES, ENGINE

14"x42" Hendey G.H., M.I.B., 1940
24"x14 ft. bed American G.H., Q.C.G., serial 44070
32"x30 ft. bed Niles Bement Pond G.H., like new
24"x20' bed LeBlond heavy duty, DC motor, older
54"x30' bed Pond, DC motors, older but excellent

LATHES, MFG. & MISC. & TURRET

17"x72" LeBlond Rapid production (5), 1946-1947
No. H5 Libby International saddle type universal turret lathe, 1940
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES

No. 2 Brown & Sharpe vertical
No. 2 Cincinnati HI-Power plain horizontal
No. 4 Cincinnati HI-power plain horizontal
No. 5 Cincinnati HI-power plain horiz., vert. attach.
No. 2-18 Cincinnati production mill, late
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 3B and 4K Kearney & Trecker plain, late type
No. 22L Van Norman pl. horiz., 1942.
54" Ingersoll 3 spdl rotary, 1940.
24"x24"x12 ft. Ingersoll adj. rail planer type mill, tracer controlled, 1945
42"x42"x18 ft. Ingersoll adj. rail double housing mill, 2 S.H. and 1 R.H. power on rail and head
42" Ingersoll 3 spindle rotary continuous mill
42" Ingersoll 2 spindle rotary continuous mill
43"x20"x20 ft. Ingersol fixed rail double faced planer type mill
60"x48"x16 ft. Ingersoll adj. rail double housing planer type mill, 2 S.H. and 2 R.H.
72" swing 64" table Ingersoll 2 spindle rotary continuous mill, timken bearings.

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500 Ton Baldwin Southwark Hyspeed Hydraulic 1939
1000 Ton No. 666 Toledo Forging
105 Ton No. 7½ Verson O.B.I. (2)
200 Ton No. 23 Bliss embossing
300 ton No. 1039 Hamilton S.A., D.C.
400 ton No. 668 Toledo knuckle joint
126 Ton No. 93½D Toledo D.C., S.S.
106 Ton No. 93C Toledo SS. DC. air cushion
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3 to 60 ton O.B.I., most every make

SHAPERS & SLOTTERS

24" Gould & Eberhardt ind. universal shaper
32" Gould & Eberhardt Invincible, F.M.D.
36" Rockford vert. hyd. slotter, 1942

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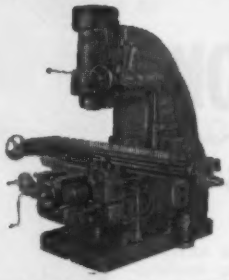

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LATHES, 16"x154" Con. Hendey, T.A., Tim.
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20"-32"x168" Con. Amer. Pacemaker, '49
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HEALD No. 45, 49 double end Borematic; M.D.

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NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT
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CINCINNATI 1-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VG1-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Radial

AMERICAN 4' arm 11" col. "Hole Wizard", late type
AMERICAN 5' arm 11" col. "Hole Wizard", late type
AMERICAN 5' arm 13" col. "Hole Wizard", late type
CARLTON 5' arm 11" column; motor drive; late

DRILLS—Manufacturing

BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
LELAND-GIFFORD 1LMS, single spindle, M.D.
LELAND-GIFFORD 1LMS, 4-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 4-spindle, M.D.; late
NATCO B-4-B "Hole Steel" 60 adj. spindles; late
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO C-5 and E-5 high speed. 10 adj. spindles; late

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FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; internal cap. 72" diameter; late type
FELLOWS No. 61A & 615A High Speed Gear Shaper
FELLOWS No. 6Z2 High Speed Gear Shaper; late
FELLOWS No. 7, No. 7A, No. 72 and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late

GLEASON GEAR EQUIPMENT

GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 4 Tester; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 12 Tool Sharpener; motor drive
GLEASON No. 13 Hyp. Cutter Sharpener; late
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON #14 "Conifles" Straight Bevel Gear Generator; late
GLEASON No. 14 Spiral Bevel Hyp. Gear Grinder
GLEASON No. 17 Spiral Bevel, Zerol and Hypoid Gear Grinder, M.D., late type
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON #22 Hypoid Formate Gear Finisher; late
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.

BROWN & SHARPE #3 Univ. motor drive, late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Model ER Plain, "Filmatic"
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 14"x36" type DC plain hydr. with infeed; late
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type

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NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" type "C" Plain; late type

LATHES, Turret

GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late
WARNER & SWASEY #2 Geared Head; late type
WARNER & SWASEY #3 and #5 Univ. ram type

LATHES, Engine & Mfg.

CINCINNATI 14"x54" e.c., motor drive; late
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 14"x42" centers; Timken; late type
HENDEY 24"x36" centers; motor drive; late type
LeBLOND 42"x108" centers, Timken; M.D., late type
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LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
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NILES 30"x108" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x48" c.c., motor drive; late type
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain

BROWN & SHARPE #2 M.D. late type
BROWN & SHARPE #10, motor drive; late type
BROWN & SHARPE #12, motor drive; late type
CINCINNATI 1-1R Production; Timken; late type
KEARNEY & TRECKER 2HL & 4H. M.D., late

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HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x36" and 8"x72"; #HT 12"x24" and #HT 12"x36" centers; late type
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MILLING MACHINES, Universal

CINCINNATI #3 Dial Type, Timken, M.D., late
VAN NORMAN #22L, #28 and #36 ram type; late

MILLING MACHINES, Vertical

CINCINNATI #4 High Speed Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER #2H, #3K and #4H late

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SHAW 250-ton Hydraulic flanging press; late type
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HENDEY 12" High Speed Univ. Crank Shaper; late
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MISCELLANEOUS

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LeBLOND No. 2 Deep Hole Rifling, late type
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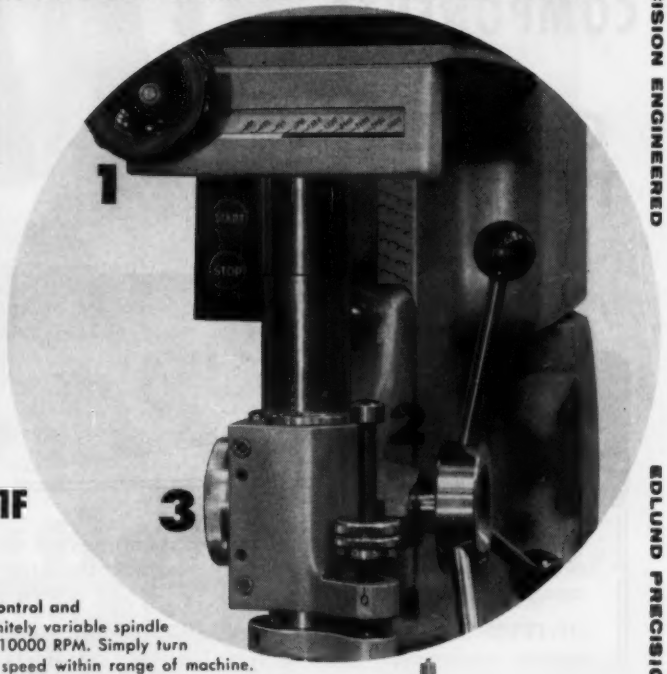

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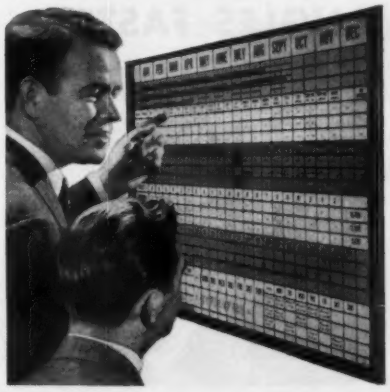

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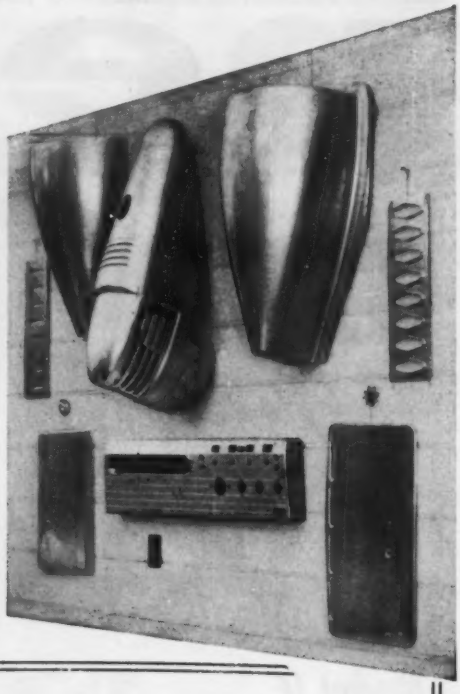

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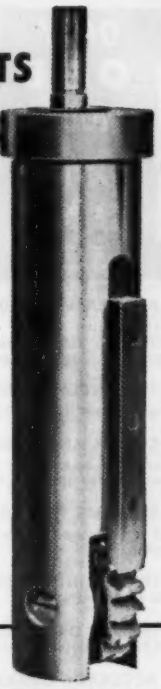

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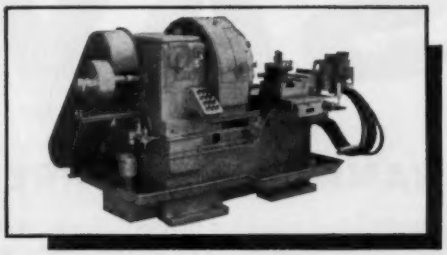

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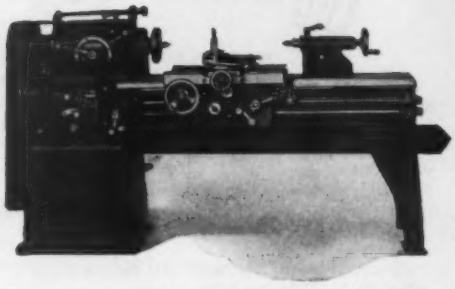

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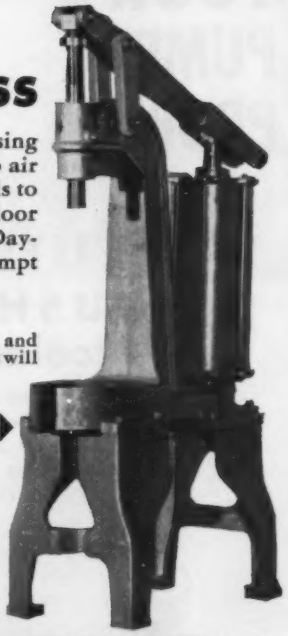

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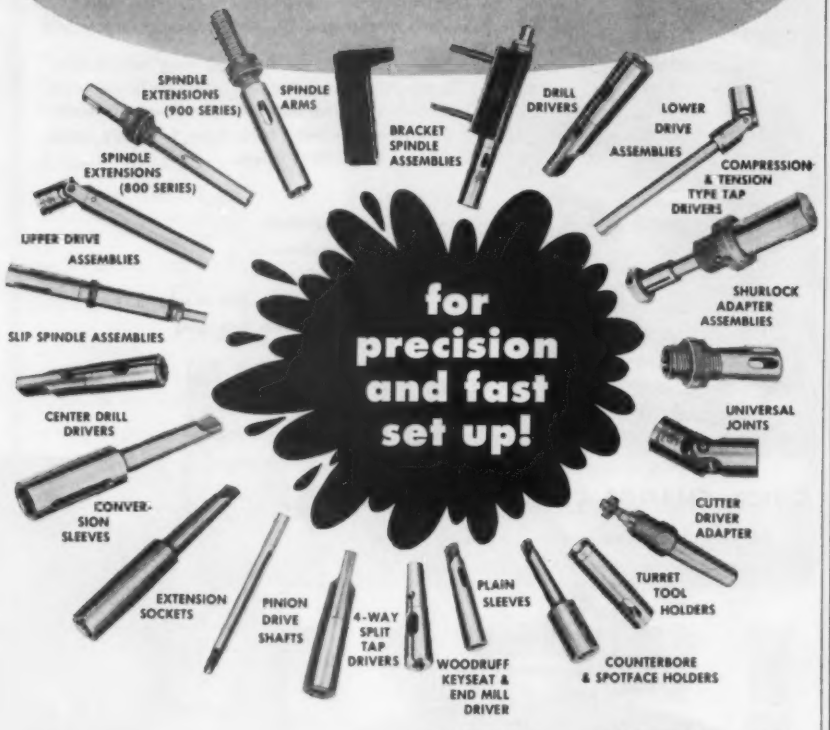

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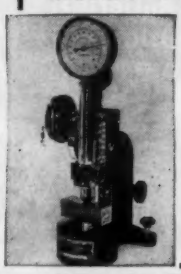

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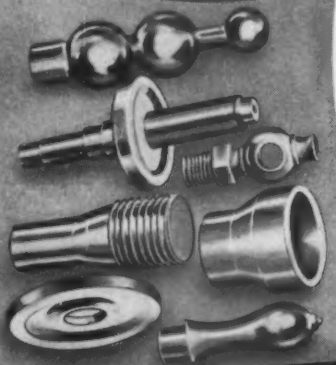

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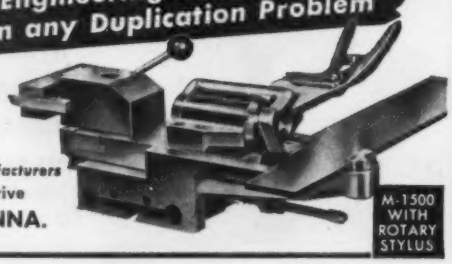

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New Cleveland high speed automatic gets increased precision from TIMKEN® bearings in semi-flexible mounting

DESIGNED to be the "work horse" of many shops, this 2½" Model AW automatic, built by the Cleveland Automatic Machine Company, Cincinnati, Ohio, is not only precise, it's versatile as well.

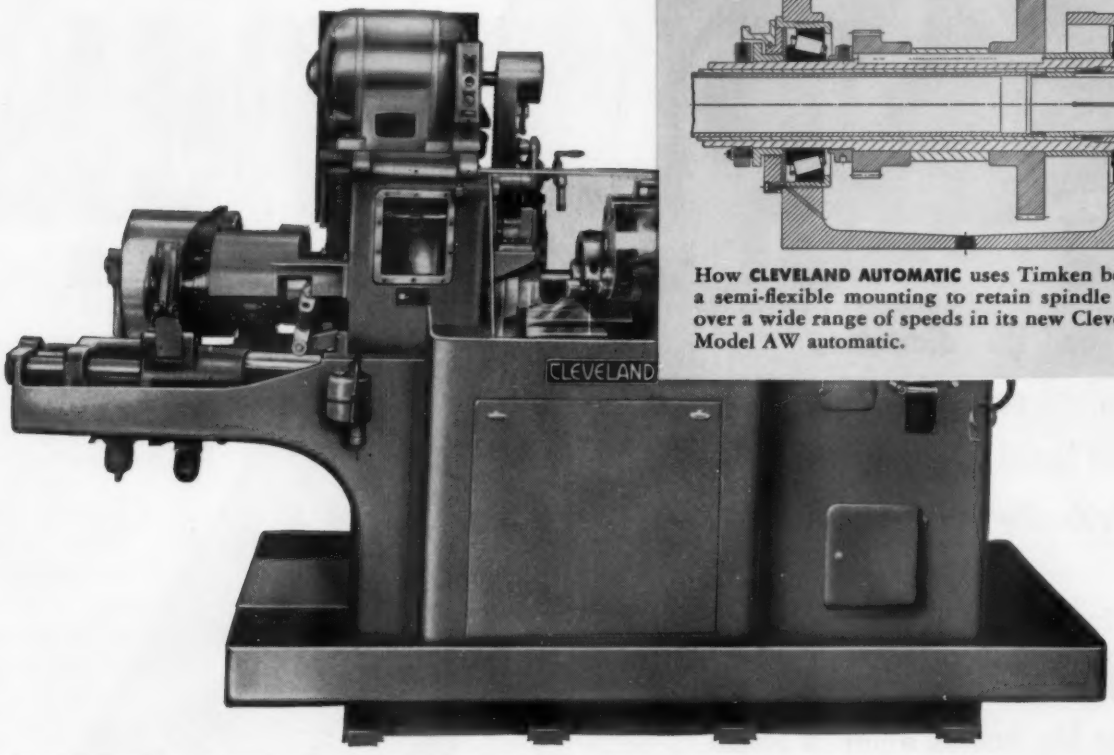
To accommodate its wide range of spindle speeds—40 in all—ranging from 69 to 1920 RPM, and to insure precision at any speed, Cleveland mounts the spindle on Timken® bearings in semi-flexible mounts. This permits any expansion during high speed operation without affecting accuracy.

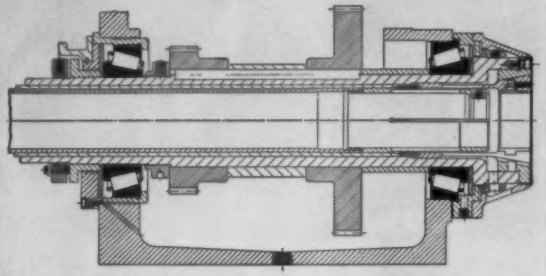
Timken tapered roller bearings hold shafts and spindles in rigid alignment. Line contact between rollers and races provides extra load-carrying capacity. Gears mesh smoothly with minimum wear under even the heaviest loads. Because of their tapered construction, Timken bearings carry radial and thrust loads in any combination.

The true rolling motion and incredibly smooth surface finish of Timken bearings practically eliminate friction. Shafts and housings are held concentric, making closures more effective.

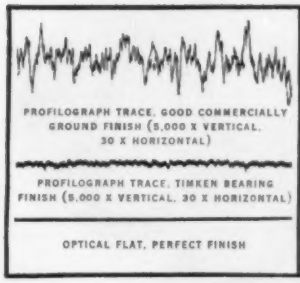
Be sure to specify Timken bearings when you build or buy machine tools. They normally last the life of the machine. Look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.





How **CLEVELAND AUTOMATIC** uses Timken bearings in a semi-flexible mounting to retain spindle precision over a wide range of speeds in its new Cleveland 2½" Model AW automatic.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PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
OPTICAL FLAT, PERFECT FINISH

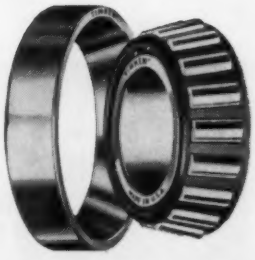
SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION